

SUPERVISING WORK ZONE TRAFFIC CONTROL

A Two and a Half - Day Training Program Developed by the
Evergreen Safety Council *and*
Washington Department of Transportation
for

TRAFFIC CONTROL SUPERVISOR *Certification*

by
Authorization
of the
Washington State
Traffic Control Oversight Committee



Washington State
Department of Transportation

6/30/2003

Contract Provisions and Plans

For Construction of

SR 512

MP 8.76 TO MP 12.06

VIC. SOUTH HILL TO SR 167 I/C

PIERCE COUNTY

F.A. PROJECT NO. NH50512(012)



**Washington State
Department of Transportation**

**Washington State
Department of Transportation
Olympia, Washington 98504**

**SR 512
VIC. SHOUTH HILL TO SR 167I/C**

**02C502
Pierce County**

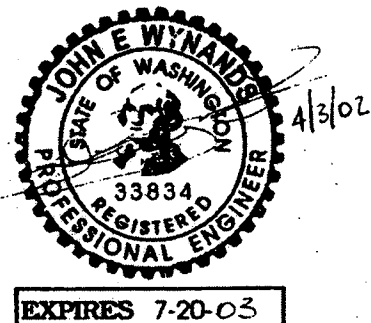
Notice to All Planholders

The Project Engineer's office assigned to answer questions regarding these bid documents and to show this project to prospective bidders is:

Fred Tharp, P.E.
1614 South Mildred, Suite M
Tacoma, WA 98465-1613
(253) 534-3100

**Randall A. Hain, P.E.
Olympic Region Administrator**

As the Engineer in direct responsible charge of developing these contract provisions, I certify these provisions have been developed or incorporated into this project under my supervision or as a result of certified specifications provided by other licensed professionals.



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INTRODUCTION

The following Amendments and Special Provisions shall be used in conjunction with the 2002 Standard Specifications for Road, Bridge, and Municipal Construction (English).

AMENDMENTS TO THE STANDARD SPECIFICATIONS

The following Amendments to the Standard Specifications are made a part of this contract and supersede any conflicting provisions of the Standard Specifications. For informational purposes, the date following each Amendment title indicates the implementation date of the Amendment or the latest date of revision.

Each Amendment contains all current revisions to the applicable section of the Standard Specifications and may include references which do not apply to this particular project.

SECTION 1-10, TEMPORARY TRAFFIC CONTROL

April 7, 2003

1-10.2(1) General

This section is revised to read:

It is the Contractor's responsibility to plan, conduct and safely perform the work.

The Contractor shall designate an individual or individuals to perform the duties of Traffic Control Manager (TCM). The TCM must be an employee of the Contractor. The duties of the TCM may not be subcontracted.

The Contractor shall also designate an individual or individuals to perform the duties of the Traffic Control Supervisor (TCS). The TCS shall be responsible for safe implementation of approved Traffic Control Plans provided by the TCM.

The TCM and TCS shall be certified as worksite traffic control supervisors by one of the organizations listed in the Special Provisions. A TCM and TCS are required on all projects that have traffic control. The TCM may also perform the duties of the TCS. The Contractor shall identify an alternate TCM and TCS who can assume the duties of the assigned or primary TCM and TCS in the event of that person's inability to perform. Such alternates shall meet the same requirements as the primary TCM and TCS.

The Contractor shall maintain 24-hour telephone numbers at which the TCM and TCS can be contacted and be available upon the Engineer's request at other than normal working hours. The TCM and TCS shall have the appropriate personnel, equipment, and material available at all times in order to expeditiously correct any deficiency in the traffic control system.

1-10.2(1)A Traffic Control Manager

This section is revised to read:

The duties of the Traffic Control Manager (TCM) shall include:

1. Overseeing and approving the actions of the Traffic Control Supervisor (TCS) to ensure that proper safety and traffic control measures are implemented and consistent with the specific requirements created by the Contractor's work zones and the Contract.
2. Providing the Contractor's designated TCS with approved Traffic Control Plans (TCP's) which are compatible with the work operations and traffic control for which they will be implemented.
3. Discussing proposed traffic control measures and coordinating implementation of the Contractor-adopted traffic control plan(s) with the Engineer.
4. Coordinating all traffic control operations, including those of subcontractors, suppliers, and any adjacent construction or maintenance operations.
5. Coordinating the project's activities (such as ramp closures, road closures, and lane closures) with appropriate police, fire control agencies, city or county engineering, medical emergency agencies, school districts, and transit companies.
6. Overseeing all requirements of the contract which contribute to the convenience, safety, and orderly movement of vehicular and pedestrian traffic.

7. Having the latest adopted edition of the MUTCD including the Modifications to the MUTCD for Streets and Highways for the State of Washington and applicable standards and specifications available at all times on the project.
8. Attending all project meetings where traffic management is discussed.
9. 9 Reviewing the TCS diaries daily and being aware of "field" traffic control operations.
10. Assuring daily submissions of previous day's TCS diaries, indicating date of TCM review, to WSDOT TCS.
11. Being present on-site a sufficient amount of time to adequately accomplish the above-listed duties.

1-10.2(1)B Traffic Control Supervisor

This section is revised to read:

A Traffic Control Supervisor (TCS) shall be on the project whenever traffic control labor is required or less frequently, as approved by the Engineer.

The TCS shall personally perform all the duties of the TCS. During non-work periods, the TCS shall be available to the job site within a 45-minute time period after notification by the Engineer.

The TCS's duties shall include:

1. Inspecting traffic control devices and nighttime lighting for proper location, installation, message, cleanliness, and effect on the traveling public. Traffic control devices shall be inspected each work shift except that Class A signs and nighttime lighting need to be checked only once a week. Traffic control devices left in place for 24 hours or more should also be inspected once during the nonworking hours when they are initially set up (during daylight or darkness, whichever is opposite of the working hours).
2. Preparing a daily traffic control diary on DOT Forms 421-040A and 421-040B, which shall be submitted to the Engineer no later than the end of the next working day to become a part of the project records. The Contractor may use their own form if it is approved by the Engineer. Include in the diary such items as:
 - a. When signs and traffic control devices are installed and removed,
 - b. Location and condition of signs and traffic control devices,
 - c. Revisions to the approved traffic control plan (TCP),
 - d. Lighting utilized at night, and
 - e. Observations of traffic conditions.
3. Ensuring that corrections are made if traffic control devices are not functioning as required. The TCS may make minor revisions to the approved traffic control plan to accommodate site conditions as long as the original intent of the traffic control plan is maintained and the revision has concurrence of the TCM and/or WSDOT TCS.
4. Attending traffic control coordinating meetings or coordination activities as authorized by the Engineer.
5. Ensuring that all needed traffic control devices are available and in good working condition prior to the need to install those devices.
6. Having a current set of approved TCP's and applicable contract provisions as provided by the TCM and the latest adopted edition of the MUTCD including the Modifications to

1 the MUTCD for Streets and Highways for the State of Washington and applicable
2 standards and specifications.
3 The TCS may perform the work described by "Traffic Control Labor" as long as the duties of the
4 TCS are accomplished. Possession of a current flagging card by the TCS is mandatory.
5
6 A reflective vest and a hard hat shall be worn by the TCS.
7

8 **1-10.2(2) Traffic Control Plans**

9 This section including title is revised to read:
10

11 **1-10.2(2) Traffic Control Plans (TCPs)**

12 The traffic control plan or plans appearing in the contract plans show a method of
13 handling traffic. All flaggers are to be shown on the traffic control plan except for
14 emergency situations. The Contractor shall designate and adopt in writing the specific
15 traffic control plan or plans required for their method of performing the work. If the
16 Contractor's methods differ from the contract traffic control plan(s), the Contractor shall
17 propose modification of the traffic control plan(s) by showing the necessary construction
18 signs, flaggers, and other traffic control devices required for the project. The Contractor's
19 modified traffic control plan(s) shall be in accordance with the established standards for
20 plan development as shown in the MUTCD, Part VI. The Contractor's letter designating
21 and adopting the specific traffic control plan(s) or any proposed modified plan(s) shall be
22 submitted to the Engineer for approval at least ten calendar days in advance of the time
23 the signs and other traffic control devices will be required. The Contractor shall be solely
24 responsible for providing copies of the approved Traffic Control Plans to the Traffic
25 Control Supervisor.
26

27 **1-10.2(3) Conformance to Established Standards**

28 The second sentence in the sixth paragraph (Category 4) is deleted.

SPECIAL PROVISIONS

The following Special Provisions are made a part of this contract and supersede any conflicting provisions of the 2002 Standard Specifications for Road, Bridge and Municipal Construction (English), and the foregoing Amendments to the Standard Specifications.

Several types of Special Provisions are included in this contract; General, Region, Bridges and Structures, and Project Specific. Special Provisions types are differentiated as follows:

(date)	General Special
(*****)	Notes a revision to a General Special Provision and also notes a Project Specific Special Provision.
(Regions ¹ date)	Region Special Provision
(BSP date)	Bridges and Structures Special Provision

General Special Provisions are commonly applicable statewide.

Region Special Provisions are commonly applicable within the designated Region.

Region designations are as follows:

Regions¹

ER	Eastern Region
NCR	North Central Region
NWR	Northwest Region
OR	Olympic Region
SCR	South Central Region
SWR	Southwest Region

WSF Washington State Ferries Division

Bridges and Structures Special Provisions are commonly applicable statewide.

Project Specific Special Provisions normally appear only in the contract for which they developed.

DIVISION 1

GENERAL REQUIREMENTS

DESCRIPTION OF WORK

(March 13, 1995)

This contract provides for the improvement of *** 2.33 miles of SR 512 and 0.87 miles of SR 167 Ramps in Pierce County, SR 512 MP 8.76 to MP 12.06, by pavement repairing, crack sealing, planing asphalt concrete pavement, paving with asphalt concrete pavement CL. A, guardrail, pavement marking, permanent signing, *** and other work, all in accordance with the attached Contract Plans, these Contract Provisions, and the Standard Specifications.

BID PROCEDURES AND CONDITIONS

Preparation Of Proposal

(June 26, 2000)

SR 512
VIC. SOUTH HILL TO SR 167 I/C

1 The seventh paragraph of Section 1-02.6 is supplemented with the following:

2
3 A minimum bid of ***\$35.00*** per hour has been established for the item "Traffic
4 Control Labor". If the Contractor's bid is less than the minimum specified amount, the
5 Contracting Agency will unilaterally revise the bid amount to the minimum specified
6 amount and recalculate the Contractor's total bid amount. The corrected total bid
7 amount will be used by the Contracting Agency for award purposes and to fix the
8 amount of the contract bond.

9
10 (September 5, 1995)

11 On this project, the bidder will not be required to submit with the bid a list of:

- 12
13 1. Subcontractors, and
14 2. The work the subcontractors will perform.
15

16 **(November 20, 2000)**

17 **Public Opening Of Proposal**

18 Section 1-02.12 is supplemented with the following:

19
20 ***Date Of Opening Bids***

21 Sealed bids are to be received at one of the following locations prior to the time
22 Specified:

- 23
24 1. At Post Office Box 47360, Olympia, Washington 98504-7360 until 11:00 A.M. of
25 the bid opening date. The Department of Transportation will consider notification
26 of bid receipt by the Post Office as the actual receipt of the bid.
27
28 2. In the Department of Transportation Bid Room, located at the Transportation
29 Building, 310 Maple Park Avenue SE, Olympia WA 98501-2361, until 11:00 A.M.
30 of the bid opening date. Bids delivered in person will be received only in the Bid
31 Room on the bid opening date.
32

33 The bid opening date for this project is Wednesday, May 1, 2003. Bids received will
34 be publicly opened and after 11:00 A. M. on this date.
35

36 **CONTROL OF WORK**

37
38 **Conformity With And Deviations From Plans And Stakes**

39 Section 1-05.4 is supplemented with the following:

40
41 ***(August 6, 2001)***

42 ***Contractor Surveying - Roadway***

43 Copies of the Contracting Agency provided primary survey control data are available for
44 the bidder's inspection at the office of the Project Engineer.
45

46 The Contractor shall be responsible for setting, maintaining, and resetting all alignment
47 stakes, slope stakes, and grades necessary for the construction of the roadbed,
48 drainage, surfacing, paving, channelization and pavement marking, illumination and
49 signals, guardrails and barriers, and signing. Except for the survey control data to be
50 furnished by the Contracting Agency, calculations, surveying, and measuring required
51 for setting and maintaining the necessary lines and grades shall be the Contractor's
52 responsibility.
53

1 Detailed survey records shall be maintained, including a description of the work
2 performed on each shift, the methods utilized, and the control points used. The record
3 shall be adequate to allow the survey to be reproduced. A copy of each day's record
4 shall be provided to the Engineer within three working days after the end of the shift.
5

6 The meaning of words and terms used in this provision shall be as listed in "Definitions
7 of Surveying and Associated Terms" current edition, published by the American
8 Congress on Surveying and Mapping and the American Society of Civil Engineers.
9

10 The survey work shall include but not be limited to the following:
11

- 12 1. Verify the primary horizontal and vertical control furnished by the Contracting
13 Agency, and expand into secondary control by adding stakes and hubs as well as
14 additional survey control needed for the project. Provide descriptions of secondary
15 control to the Contracting Agency.
16
- 17 2. Establish the centerlines of all alignments, by placing hubs, stakes, or marks on
18 centerline or on offsets to centerline at all curve points (PCs, PTs, and PIs) and at
19 points on the alignments spaced no further than 50 feet.
20
- 21 3. Establish clearing limits, placing stakes at all angle points and at intermediate points
22 not more than 50 feet apart.
23
- 24 4. Establish grading limits, placing slope stakes at centerline increments not more than
25 50 feet apart. Establish offset reference to all slope stakes.
26
- 27 5. Establish the horizontal and vertical location of all drainage features, placing offset
28 stakes to all drainage structures and to pipes at a horizontal interval not greater than
29 25 feet.
30
- 31 6. Establish roadbed and surfacing elevations by placing stakes at the top of subgrade
32 and at the top of each course of surfacing. Subgrade and surfacing stakes shall be
33 set at horizontal intervals not greater than 50 feet in tangent sections, 25 feet in
34 curve sections with a radius less than 300 feet, and at 10- foot intervals in
35 intersection radii with a radius less than 10 feet. Transversely, stakes shall be placed
36 at all locations where the roadway slope changes and at additional points such that
37 the transverse spacing of stakes is not more than 12 feet.
38
- 39 7. Establish intermediate elevation benchmarks as needed to check work throughout
40 the project.
41
- 42 8. Provide references for paving pins at 25-foot intervals or provide simultaneous
43 surveying to establish location and elevation of paving pins as they are being placed.
44
- 45 9. For all other types of construction included in this provision, (including but not limited
46 to channelization and pavement marking, illumination and signals, guardrails and
47 barriers, and signing) provide staking and layout as necessary to adequately locate,
48 construct, and check the specific construction activity.
49

50 The Contractor shall provide the Contracting Agency copies of any calculations and
51 staking data when requested by the Engineer.
52

53 To facilitate the establishment of these lines and elevations, the Contracting Agency will
54 provide the Contractor with primary survey control information consisting of descriptions

of two primary control points used for the horizontal and vertical control, and descriptions of two additional primary control points for every additional three miles of project length. Primary control points will be described by reference to the project alignment and the coordinate system and elevation datum utilized by the project. In addition, the Contracting Agency will supply horizontal coordinates for the beginning and ending points and for each Point of Intersection (PI) on each alignment included in the project.

The Contractor shall ensure a surveying accuracy within the following tolerances:

	<u>Vertical</u>	<u>Horizontal</u>
Slope stakes	±0.10 feet	±0.10 feet
Subgrade grade stakes set 0.04 feet below grade	0 high 0.04 feet low	±0.5 feet (parallel to alignment) ±0.1 feet (normal to alignment)
Stationing on roadway	N/A	±0.1 feet
Alignment on roadway	N/A	±0.04 feet
Surfacing grade stakes	±0.01 feet	±0.5 feet (parallel to alignment) ±0.1 feet (normal to alignment)
Roadway paving pins for surfacing or paving	±0.04 feet	±0.2 feet (parallel to alignment) ±0.1 feet (normal to alignment)

The Contracting Agency may spot-check the Contractor's surveying. These spot-checks will not change the requirements for normal checking by the Contractor.

When staking roadway alignment and stationing, the Contractor shall perform independent checks from different secondary control to ensure that the points staked are within the specified survey accuracy tolerances.

The Contractor shall calculate coordinates for the alignment. The Contracting Agency will verify these coordinates prior to issuing approval to the Contractor for commencing with the work. The Contracting Agency will require up to seven calendar days from the date the data is received.

Contract work to be performed using contractor-provided stakes shall not begin until the stakes are approved by the Contracting Agency. Such approval shall not relieve the Contractor of responsibility for the accuracy of the stakes.

Stakes shall be marked in accordance with Standard Plan H-14. When stakes are needed that are not described in the Plans, then those stakes shall be marked as directed by the Engineer.

Payment

Payment will be made in accordance with Section 1-04.1 for the following bid item when included in the proposal:

"Roadway Surveying", lump sum.

The lump sum contract price for "Roadway Surveying" shall be full pay for all labor, equipment, materials, and supervision utilized to perform the work specified, including any resurveying, checking, correction of errors, replacement of missing or damaged stakes, and coordination efforts.

Equipment

Section 1-05.9 is supplemented with the following:

(OR May 25, 1999)

Hauling Equipment Spill Kit

Hauling equipment shall be equipped with a spill kit as specified in the Contractor's Spill Prevention, Control, and Countermeasures (SPCC) plan.

(OR April 3, 2001)

Tack Coat Spill Kit

Tack coat spreading equipment shall be equipped with a spill kit as specified in the Contractor's Spill Prevention, Control, and Countermeasures (SPCC) plan.

CONTROL OF MATERIAL

Foreign Made Materials

Section 1-06 is supplemented with the following:

(March 13, 1995)

The major quantities of steel and iron construction material that is permanently incorporated into the project shall consist of American-made materials only.

The Contractor may utilize minor amounts of foreign steel and iron in this project provided the cost of the foreign material used does not exceed one-tenth of one percent of the total contract cost or \$2,500.00, whichever is greater.

American-made material is defined as material having all manufacturing processes occur in the United States. The action of applying a coating to steel or iron is deemed a manufacturing process. Coating includes epoxy coating, galvanizing, aluminizing, painting, and any other coating that protects or enhances the value of steel or iron. Any process from the original reduction from ore to the finished product constitutes a manufacturing process for iron. The following are considered to be steel manufacturing processes:

1. Production of steel by any of the following processes:

a. Open hearth furnace

b. Basic oxygen

c. Electric furnace

d. Direct reduction

2. Rolling, heat treating, and any other similar processing

1 3. Fabrication of the products

2
3 a. Spinning wire into cable or strand

4
5 b. Corrugating and rolling into culverts

6
7 c. Shop fabrication

8
9 A certification of materials origin will be required for any items comprised of, or
10 containing, steel or iron construction materials prior to such items being incorporated into
11 the permanent work. The certification shall be on DOT Form 350-109 provided by the
12 Engineer, or such other form the Contractor chooses, provided it contains same
13 information as DOT Form 350-109.
14

15 **LEGAL RELATIONS AND RESPONSIBILITIES TO THE PUBLIC**

16
17 **Laws To Be Observed**

18 Section 1-07.1 is supplemented with the following:

19
20 *(October 15, 2001)*

21 ***Maintenance Walkways and Platforms for VMS Boards and Sign Bridges***

22 The Contractor is alerted that it has been determined that there is open side exposure to
23 falls, and a lack of toe boards along the rail on existing and new maintenance walkways.
24 It is required that individuals working on these maintenance walkways must be protected
25 by a fall protection system.
26

27 The WSDOT, for its own purposes, has chosen to use aerial lift equipment for accessing
28 and performing work operations on Sign Bridges and VMS Boards.
29

30 **State Taxes**

31 Section 1-07.2 is supplemented with the following:

32
33 *(March 13, 1995)*

34 The work on this contract is to be performed upon lands whose ownership obligates the
35 Contractor to collect State sales tax from the Contracting Agency. The provisions of
36 Section 1-07.2(2) apply.
37

38 **Fish And Wildlife and Ecology Regulations**

39
40 ***State Department of Ecology***

41 Section 1-07.5(3) is supplemented with the following:

42
43 *(OR April 3, 2001)*

44 The Contractor shall comply with all applicable requirements and conditions of
45 the "Implementing Agreement Between the Washington State Department of
46 Ecology and the Washington State Department of Transportation Regarding
47 Compliance with the State of Washington Surface Water Quality Standards". A
48 copy of the Agreement is attached as an appendix and made a part of this
49 contract.
50

51 All costs to comply with the requirements and conditions of the Agreements, shall
52 be included in the applicable bid items for the work involved.
53

1 **Permits And Licenses**

2 Section 1-07.6 is supplemented with the following:

3
4 (March 13, 1995)

5 No hydraulic permits are required for this project unless the Contractor's operations use,
6 divert, obstruct, or change the natural flow or bed of any river or stream, or utilize any of
7 the waters of the State or materials from gravel or sand bars, or from stream beds.

8
9 **Load Limits**

10 Section 1-07.7 is supplemented with the following:

11
12 (March 13, 1995)

13 If the sources of materials provided by the Contractor necessitates hauling over roads
14 other than State Highways, the Contractor shall, at the Contractor's expense, make all
15 arrangements for the use of the haul routes.

16
17 **Wages**

18
19 **General**

20 Section 1-07.9(1) is supplemented with the following:

21
22 (March 6, 2002)

23 The Federal wage rates incorporated in this contract have been established by
24 the Secretary of Labor under United States Department of Labor General
25 Decision No. WA020001.

26
27 **Equal Employment Opportunity Responsibilities**

28 Section 1-07.11 is supplemented with the following:

29
30 (March 6, 2000)

31 Requirement For Affirmative Action to Ensure Equal Employment Opportunity (Executive
32 Order 11246)

- 33
- 34 1. The Contractor's attention is called to the Equal Opportunity Clause and the
35 Standard Federal Equal Employment Opportunity Construction Contract
36 Specifications set forth herein.
 - 37
 - 38 2. The goals and timetables for minority and female participation set by the Office of
39 Federal Contract Compliance Programs, expressed in percentage terms for the
40 Contractor's aggregate work force in each construction craft and in each trade on all
41 construction work in the covered area, are as follows:

42
43 Women - Statewide

44
45 Timetable

46
47 Goal

48 Until further notice

6.9%

49 Minorities - by Standard Metropolitan Statistical Area (SMSA)

50 Spokane, WA:

51 SMSA Counties:

52 Spokane, WA

2.8

53 WA Spokane.

Non-SMSA Counties	3.0
WA Adams; WA Asotin; WA Columbia; WA Ferry; WA Garfield; WA Lincoln; WA Pend Oreille; WA Stevens; WA Whitman.	
Richland, WA	
SMSA Counties:	
Richland Kennewick, WA	5.4
WA Benton; WA Franklin.	
Non-SMSA Counties	3.6
WA Walla Walla.	
Yakima, WA:	
SMSA Counties:	
Yakima, WA	9.7
WA Yakima.	
Non-SMSA Counties	7.2
WA Chelan; WA Douglas; WA Grant; WA Kittitas; WA Okanogan.	
Seattle, WA:	
SMSA Counties:	
Seattle Everett, WA	7.2
WA King; WA Snohomish.	
Tacoma, WA	6.2
WA Pierce.	
Non-SMSA Counties	6.1
WA Clallam; WA Grays Harbor; WA Island; WA Jefferson; WA Kitsap; WA Lewis; WA Mason; WA Pacific; WA San Juan; WA Skagit; WA Thurston; WA Whatcom.	
Portland, OR:	
SMSA Counties:	
Portland, OR-WA	4.5
WA Clark.	
Non-SMSA Counties	3.8
WA Cowlitz; WA Klickitat; WA Skamania; WA Wahkiakum.	

These goals are applicable to each nonexempt Contractor's total on-site construction workforce, regardless of whether or not part of that workforce is performing work on a Federal, or federally assisted project, contract, or subcontract until further notice. Compliance with these goals and timetables is enforced by the Office of Federal Contract compliance Programs.

The Contractor's compliance with the Executive Order and the regulations in 41 CFR Part 60-4 shall be based on its implementation of the Equal Opportunity Clause, specific affirmative action obligations required by the specifications set forth in 41 CFR 60-4.3(a), and its efforts to meet the goals. The hours of minority and female employment and training must be substantially uniform throughout the length of the contract, in each construction craft and in each trade, and the Contractor shall make a good faith effort to employ minorities and women evenly on each of its projects. The transfer of minority or female employees or trainees from Contractor to Contractor or from project to project for the sole purpose of meeting the Contractor's goal shall be a violation of the contract, the Executive Order and the regulations in 41 CFR Part 60-4. Compliance with the goals will be measured against the total work hours performed.

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3 3. The Contractor shall provide written notification to the Engineer within 10 working
4 days of award of any construction subcontract in excess of \$10,000 or more that are
5 Federally funded, at any tier for construction work under the contract resulting from
6 this solicitation. The notification shall list the name, address and telephone number of
7 the subcontractor; employer identification number of the subcontractor; estimated
8 dollar amount of the subcontract; estimated starting and completion dates of the
9 subcontract; and the geographical area in which the contract is to be performed.
10
11 4. As used in this Notice, and in the contract resulting from this solicitation, the Covered
12 Area is as designated herein.

13 Standard Federal Equal Employment Opportunity Construction Contract Specifications
14 (Executive Order 11246)
15

- 16 1. As used in these specifications:
17
18 a. Covered Area means the geographical area described in the solicitation from
19 which this contract resulted;
20
21 b. Director means Director, Office of Federal Contract Compliance Programs,
22 United States Department of Labor, or any person to whom the Director
23 delegates authority;
24
25 c. Employer Identification Number means the Federal Social Security number used
26 on the Employer's Quarterly Federal Tax Return, U. S. Treasury Department
27 Form 941;
28
29 d. Minority includes:
30
31 (1) Black, a person having origins in any of the Black Racial Groups of Africa.
32
33 (2) Hispanic, a fluent Spanish speaking, Spanish surnamed person of Mexican,
34 Puerto Rican, Cuban, Central American, South American, or other Spanish
35 origin.
36
37 (3) Asian or Pacific Islander, a person having origins in any of the original
38 peoples of the Pacific rim or the Pacific Islands, the Hawaiian Islands and
39 Samoa.
40
41 (4) American Indian or Alaskan Native, a person having origins in any of the
42 original peoples of North America, and who maintain cultural identification
43 through tribal affiliation or community recognition.
44
45 2. Whenever the Contractor, or any Subcontractor at any tier, subcontracts a portion of
46 the work involving any construction trade, it shall physically include in each
47 subcontract in excess of \$10,000 the provisions of these specifications and the
48 Notice which contains the applicable goals for minority and female participation and
49 which is set forth in the solicitations from which this contract resulted.
50
51 3. If the Contractor is participating (pursuant to 41 CFR 60-4.5) in a Hometown Plan
52 approved by the U.S. Department of Labor in the covered area either individually or
53 through an association, its affirmative action obligations on all work in the Plan area
54 (including goals and timetables) shall be in accordance with that Plan for those

1 trades which have unions participating in the Plan. Contractors must be able to
2 demonstrate their participation in and compliance with the provisions of any such
3 Hometown Plan. Each Contractor or Subcontractor participating in an approved Plan
4 is individually required to comply with its obligations under the EEO clause, and to
5 make a good faith effort to achieve each goal under the Plan in each trade in which it
6 has employees. The overall good faith performance by other Contractors or
7 Subcontractors toward a goal in an approved Plan does not excuse any covered
8 Contractor's or Subcontractor's failure to take good faith effort to achieve the Plan
9 goals and timetables.

- 10
- 11 4. The Contractor shall implement the specific affirmative action standards provided in
12 paragraphs 7a through 7p of this Special Provision. The goals set forth in the
13 solicitation from which this contract resulted are expressed as percentages of the
14 total hours of employment and training of minority and female utilization the
15 Contractor should reasonably be able to achieve in each construction trade in which
16 it has employees in the covered area. Covered construction contractors performing
17 construction work in geographical areas where they do not have a Federal or
18 federally assisted construction contract shall apply the minority and female goals
19 established for the geographical area where the work is being performed. The
20 Contractor is expected to make substantially uniform progress in meeting its goals in
21 each craft during the period specified.
- 22
- 23 5. Neither the provisions of any collective bargaining agreement, nor the failure by a
24 union with whom the Contractor has a collective bargaining agreement, to refer
25 either minorities or women shall excuse the Contractor's obligations under these
26 specifications, Executive Order 11246, or the regulations promulgated pursuant
27 thereto.
- 28
- 29 6. In order for the nonworking training hours of apprentices and trainees to be counted
30 in meeting the goals, such apprentices and trainees must be employed by the
31 Contractor during the training period, and the Contractor must have made a
32 commitment to employ the apprentices and trainees at the completion of their
33 training, subject to the availability of employment opportunities. Trainees must be
34 trained pursuant to training programs approved by the U.S. Department of Labor.
- 35
- 36 7. The Contractor shall take specific affirmative actions to ensure equal employment
37 opportunity. The evaluation of the Contractor's compliance with these specifications
38 shall be based upon its effort to achieve maximum results from its action. The
39 Contractor shall document these efforts fully, and shall implement affirmative action
40 steps at least as extensive as the following:
- 41
- 42 a. Ensure and maintain a working environment free of harassment, intimidation, and
43 coercion at all sites, and in all facilities at which the Contractor's employees are
44 assigned to work. The Contractor, where possible, will assign two or more
45 women to each construction project. The Contractor shall specifically ensure that
46 all foremen, superintendents, and other on-site supervisory personnel are aware
47 of and carry out the Contractor's obligation to maintain such a working
48 environment, with specific attention to minority or female individuals working at
49 such sites or in such facilities.
- 50
- 51 b. Establish and maintain a current list of minority and female recruitment sources,
52 provide written notification to minority and female recruitment sources and to
53 community organizations when the Contractor or its unions have employment
54 opportunities available, and maintain a record of the organizations' responses.

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- c. Maintain a current file of the names, addresses and telephone numbers of each minority and female off-the-street applicant and minority or female referral from a union, a recruitment source or community organization and of what action was taken with respect to each such individual. If such individual was sent to the union hiring hall for referral and was not referred back to the Contractor by the union or, if referred, not employed by the Contractor, this shall be documented in the file with the reason therefor, along with whatever additional actions the Contractor may have taken.
 - d. Provide immediate written notification to the Director when the union or unions with which the Contractor has a collective bargaining agreement has not referred to the Contractor a minority person or woman sent by the Contractor, or when the Contractor has other information that the union referral process has impeded the Contractor's efforts to meet its obligations.
 - e. Develop on-the-job training opportunity and/or participate in training programs for the area which expressly include minorities and women, including upgrading programs and apprenticeship and trainee programs relevant to the Contractor's employment needs, especially those programs funded or approved by the U.S. Department of Labor. The Contractor shall provide notice of these programs to the sources compiled under 7b above.
 - f. Disseminate the Contractor's EEO policy by providing notice of the policy to unions and training programs and requesting their cooperation in assisting the Contractor in meeting its EEO obligations; by including it in any policy manual and collective bargaining agreement; by publicizing it in the company newspaper, annual report, etc.; by specific review of the policy with all management personnel and with all minority and female employees at least once a year; and by posting the company EEO policy on bulletin boards accessible to all employees at each location where construction work is performed.
 - g. Review, at least annually, the company's EEO policy and affirmative action obligations under these specifications with all employees having any responsibility for hiring, assignment, layoff, termination or other employment decisions including specific review of these items with on-site supervisory personnel such as Superintendents, General Foremen, etc., prior to the initiation of construction work at any job site. A written record shall be made and maintained identifying the time and place of these meetings, persons attending, subject matter discussed, and disposition of the subject matter.
 - h. Disseminate the Contractor's EEO policy externally by including it in any advertising in the news media, specifically including minority and female news media, and providing written notification to and discussing the Contractor's EEO policy with other Contractors and Subcontractors with whom the Contractor does or anticipates doing business.
 - i. Direct its recruitment efforts, both oral and written to minority, female and community organizations, to schools with minority and female students and to minority and female recruitment and training organizations serving the Contractor's recruitment area and employment needs. Not later than one month prior to the date for the acceptance of applications for apprenticeship or other training by any recruitment source, the Contractor shall send written notification

to organizations such as the above, describing the openings, screening procedures, and tests to be used in the selection process.

- j. Encourage present minority and female employees to recruit other minority persons and women and where reasonable, provide after school, summer and vacation employment to minority and female youth both on the site and in other areas of a Contractor's work force.
 - k. Validate all tests and other selection requirements where there is an obligation to do so under 41 CFR Part 60-3.
 - l. Conduct, at least annually, an inventory and evaluation of all minority and female personnel for promotional opportunities and encourage these employees to seek or to prepare for, through appropriate training, etc., such opportunities.
 - m. Ensure that seniority practices, job classifications, work assignments and other personnel practices, do not have a discriminatory effect by continually monitoring all personnel and employment related activities to ensure that the EEO policy and the Contractor's obligations under these specifications are being carried out.
 - n. Ensure that all facilities and company activities are nonsegregated except that separate or single-user toilet and necessary changing facilities shall be provided to assure privacy between the sexes.
 - o. Document and maintain a record of all solicitations of offers for subcontracts from minority and female construction contractors and suppliers, including circulation of solicitations to minority and female contractor associations and other business associations.
 - p. Conduct a review, at least annually, of all supervisors' adherence to and performance under the Contractor's EEO policies and affirmative action obligations.
8. Contractors are encouraged to participate in voluntary associations, which assist in fulfilling one or more of their affirmative action obligations (7a through 7p). The efforts of a contractor association, joint contractor-union, contractor-community, or other similar group of which the Contractor is a member and participant, may be asserted as fulfilling any one or more of the obligations under 7a through 7p of this Special Provision provided that the Contractor actively participates in the group, makes every effort to assure that the group has a positive impact on the employment of minorities and women in the industry, ensure that the concrete benefits of the program are reflected in the Contractor's minority and female work- force participation, makes a good faith effort to meet its individual goals and timetables, and can provide access to documentation which demonstrate the effectiveness of actions taken on behalf of the Contractor. The obligation to comply, however, is the Contractor's and failure of such a group to fulfill an obligation shall not be a defense for the Contractor's noncompliance.
9. A single goal for minorities and a separate single goal for women have been established. The Contractor, however, is required to provide equal employment opportunity and to take affirmative action for all minority groups, both male and female, and all women, both minority and non-minority. Consequently, the Contractor may be in violation of the Executive Order if a particular group is employed in substantially disparate manner (for example, even though the Contractor has

achieved its goals for women generally, the Contractor may be in violation of the Executive Order if a specific minority group of women is underutilized).

10. The Contractor shall not use the goals and timetables or affirmative action standards to discriminate against any person because of race, color, religion, sex, or national origin.
11. The Contractor shall not enter into any subcontract with any person or firm debarred from Government contracts pursuant to Executive Order 11246.
12. The Contractor shall carry out such sanctions and penalties for violation of these specifications and of the Equal Opportunity Clause, including suspensions, terminations and cancellations of existing subcontracts as may be imposed or ordered pursuant to Executive Order 11246, as amended, and its implementing regulations by the Office of Federal Contract Compliance Programs. Any Contractor who fails to carry out such sanctions and penalties shall be in violation of these specifications and Executive Order 11246, as amended.
13. The Contractor, in fulfilling its obligations under these specifications, shall implement specific affirmative action steps, at least as extensive as those standards prescribed in paragraph 7 of this Special Provision, so as to achieve maximum results from its efforts to ensure equal employment opportunity. If the Contractor fails to comply with the requirements of the Executive Order, the implementing regulations, or these specifications, the Director shall proceed in accordance with 41 CFR 60-4.8.
14. The Contractor shall designate a responsible official to monitor all employment related activity to ensure that the company EEO policy is being carried out, to submit reports relating to the provisions hereof as may be required by the government and to keep records. Records shall at least include, for each employee, their name, address, telephone numbers, construction trade, union affiliation if any, employee identification number when assigned, social security number, race, sex, status (e.g., mechanic, apprentice, trainee, helper, or laborer), dates of changes in status, hours worked per week in the indicated trade, rate of pay, and locations at which the work was performed. Records shall be maintained in an easily understandable and retrievable form; however, to the degree that existing records satisfy this requirement, the Contractors will not be required to maintain separate records.
15. Nothing herein provided shall be construed as a limitation upon the application of other laws which establish different standards of compliance or upon the application of requirements for the hiring of local or other area residents (e.g., those under the Public Works Employment Act of 1977 and the Community Development Block Grant Program).

(August 6, 2001)

Voluntary Disadvantaged Business Enterprise (DBE) Participation

The Disadvantaged Business Enterprise (DBE) requirements of 49 CFR part 26 apply to this contract. The purpose of including a voluntary goal in this contract is to draw attention to opportunities for DBE participation. The requirements of this contract are to report what is accomplished to enable the Contracting Agency to track achievement. No preference will be included in the evaluation of bids/proposals, no minimum level of DBE participation shall be required as a condition for receiving an award and bids/proposals will not be rejected or considered non-responsive on that basis.

1 **Voluntary DBE Goals**

2 The Contracting Agency has established a voluntary goal in the amount of:

3 ***Ninety-One Thousand Dollars (\$91,000.00) For DBE Goals***

4 **Affirmative Efforts to Increase DBE Participation Through Voluntary Means**

5 Contractors are encouraged to:

- 6 1. Advertise opportunities for subcontractors or suppliers in a manner reasonably
7 designed to provide DBEs capable of performing the work with timely notice of such
8 opportunities. All advertisements should include a provision encouraging
9 participation by DBE firms and may be done through general advertisements (e.g.,
10 newspapers, journals, etc.) or by soliciting bids/proposals directly from DBEs.
11 2. Utilize the services of available minority community organizations, minority
12 Contractor groups, local minority assistance offices and organizations that provide
13 assistance in the recruitment and placement of DBEs and other small businesses.
14 15 16 17 18

19 In addition, The Office of Minority and Women's Business Enterprises has three DBE
20 Supportive Services Offices available to assist you as follows:

21 Olympia: (360) 753-9693, (Fax) (360) 586-7079
22 Seattle: (206) 553-7356, (Fax) (206) 553-0194
23 Wenatchee: (509) 665-3528, (Fax) (509) 665-3533
24 25

- 26 3. Establish delivery schedules, where requirements of the contract allow, that
27 encourage participation by DBEs and other small businesses.
28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46 47 48 49 50 51 52 53 54 55 56 57 58 59 60 61 62 63 64 65 66 67 68 69 70 71 72 73 74 75 76 77 78 79 80 81 82 83 84 85 86 87 88 89 90 91 92 93 94 95 96 97 98 99 100 101 102 103 104 105 106 107 108 109 110 111 112 113 114 115 116 117 118 119 120 121 122 123 124 125 126 127 128 129 130 131 132 133 134 135 136 137 138 139 140 141 142 143 144 145 146 147 148 149 150 151 152 153 154 155 156 157 158 159 160 161 162 163 164 165 166 167 168 169 170 171 172 173 174 175 176 177 178 179 180 181 182 183 184 185 186 187 188 189 190 191 192 193 194 195 196 197 198 199 200 201 202 203 204 205 206 207 208 209 210 211 212 213 214 215 216 217 218 219 220 221 222 223 224 225 226 227 228 229 230 231 232 233 234 235 236 237 238 239 240 241 242 243 244 245 246 247 248 249 250 251 252 253 254 255 256 257 258 259 260 261 262 263 264 265 266 267 268 269 270 271 272 273 274 275 276 277 278 279 280 281 282 283 284 285 286 287 288 289 290 291 292 293 294 295 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3. When a DBE subcontracts part of the work of its contract to another firm, the value of the subcontracted work shall be counted if the DBE's Subcontractor is also a DBE. The work that a DBE subcontracts to a non-DBE firm does not count as participation.

DBE Prime Contractor

A DBE prime Contractor shall only count the work performed with its own forces as well as the work performed by DBE Subcontractors and DBE suppliers.

Joint Venture

When a DBE performs as a participant in a joint venture, only count that portion of the total dollar value of the contract equal to the distinct, clearly defined portion of the work that the DBE performs with its own forces.

Commercially Useful Function

You may count expenditures to a DBE Contractor if the DBE is performing a commercially useful function on that contract.

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1. A DBE performs a commercially useful function when it is responsible for execution of the work of the contract and is carrying out its responsibilities by actually performing, managing, and supervising the work involved. To perform a commercially useful function, the DBE must also be responsible, with respect to materials and supplies used on the contract, for negotiating price, determining quality and quantity, ordering the material, installing (if applicable) and paying for the material itself.
 2. A DBE does not perform a commercially useful function if its role is limited to that of an extra participant in a transaction, contract, or project through which funds are passed in order to obtain the appearance of DBE participation.
 3. A DBE does not perform a commercially useful function if it fails to exercise responsibility with its own work force for at least 30 percent of the total cost of its contract.

Trucking

Use the following factors in determining whether a DBE trucking company is performing a commercially useful function:

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1. The DBE must be responsible for the management and supervision of the entire trucking operation for which it is responsible for on a particular contract, and there cannot be a contrived arrangement for the purpose of meeting the DBE goals.
 2. The DBE must itself own and operate at least one fully licensed, insured, and operational truck that is used on the contract.
 3. Credit towards project goals for DBE trucking firms who do not own at least one truck, will be granted only for the fees the DBE firm retains for providing the hauling service.
 4. In order for DBE project goals to be credited, DBE trucking firms must be covered by a subcontract or a written agreement approved by WSDOT prior to performing their portion of the work.

- 1 5. DBE trucking firms are required to perform at least fifty percent (50%) of the work
2 with his/her own trucks and personnel.
3
- 4 6. DBE trucking firms may utilize owner/operator trucks. The number of owner/operator
5 trucks may not exceed any limitations on subletting or reassigning the work
6 specified. All owner/operators must appear on the DBE Contractor's or DBE
7 Subcontractor's payroll designated as owner/operator. The hours worked or wages
8 paid may be reflected either on the payroll or on the record of payments to each
9 owner/operator.
10
- 11 7. DBE trucking firms may lease or rent trucks from other sources, except from prime
12 Contractors to whom they are Contractors, provided:
13
 - 14 a) A written valid lease/rental agreement on all trucks leased or rented is submitted
15 to the project manager prior to the beginning of work; and
16
 - 17 b) Only the vehicle (not the operator) is leased or rented.
18
 - 19 c) The agreement must include the lessors name, trucks to be leased, and agreed
20 upon amount or method of payment (hour, ton or load hauled).
21
 - 22 d) All lease agreements shall be long-term agreements, not project-by-project.
23

24 The DBE is limited to leasing or renting two (2) additional trucks for each truck
25 owned by the DBE trucking firm.
26

27 **Expenditures with DBEs**

28 Expenditures with DBEs for materials or supplies shall be counted as provided in the
29 following:
30

31 **Manufacturer**

32 If the materials or supplies are obtained from a DBE manufacturer, count 100
33 percent of the cost of the materials or supplies.
34

35 **Regular Dealer**

- 36 1. Counting If the materials or supplies are purchased from a DBE regular
37 dealer, count 60 percent of the cost of the materials or supplies.
38
- 39 2. Definition
 - 40 a) To be a regular dealer, the firm must be an established, regular business
41 that engages, as its principal business and under its own name, in the
42 purchase and sale or lease of the products in question.
43
 - 44 b) A person may be a regular dealer in such bulk items as petroleum
45 products, steel, cement, gravel, stone, or asphalt without owning,
46 operating, or maintaining a place of business, as provided elsewhere in
47 this specification, if the person both owns and operates distribution
48 equipment for the products. Any supplementing of regular dealers' own
49 distribution equipment shall be by a long-term lease agreement and not
50 on an ad hoc or contract-by-contract basis.
51
 - 52 c) Packagers, brokers, manufacturers' representatives, or other persons
53 who arrange or expedite transactions are not regular dealers.

1
2 **Purchased from a DBE**

3 With respect to materials or supplies purchased from a DBE who is neither a
4 manufacturer nor a regular dealer, count the entire amount of fees or commissions
5 charged for assistance in the procurement of the materials and supplies, or fees or
6 transportation charges for the delivery of materials or supplies required on a job site,
7 provided the fees are reasonable and typical for the services rendered. No part of the
8 cost of the materials and supplies themselves shall be counted.
9

10 **Procedures Between Award and Execution**

11 After award and prior to execution of the contract, the Contractor shall provide the
12 names and addresses of all firms that submitted a bid or quote to the Contractor as part
13 of bidding this contract and note which of those firms were successful and will participate
14 in the contract. These firms may be contacted to solicit general information as follows:
15

16 1. age of the firm

17
18 2. average of its gross annual receipts

19 This information is necessary to maintain a bidder's list in compliance with the
20 requirements of the 49 CFR, Part 26. Simply stated: who is soliciting the work
21 and what is their capacity? The Contracting Agency will use this information
22 to accurately determine an overall goal based on the percentage of DBEs
23 who are ready, willing and able to perform the work.
24

25 **Reporting**

26 The Contractor shall submit a "Quarterly Report of Amounts Credited as DBE
27 Participation" on a quarterly basis for every quarter in which the contract is active (work
28 is accomplished) or upon completion of the project, as appropriate. The quarterly reports
29 are due on the 20th of April, July, October, and January for the four respective quarters.
30 The dollars reported will be in accordance with the "DBE Eligibility" section of this
31 specification.
32

33 **Payment**

34 Payment for complying with the conditions of this specification and any associated DBE
35 requirements is the Contractor's responsibility. Those costs shall be incidental to the
36 respective bid items.
37

38 **Further Information**

39 If further information is desired concerning Disadvantaged Business Enterprise
40 participation, inquiry may be directed to:
41

42 External Civil Rights Branch
43 Office of Equal Opportunity
44 Washington State Department of Transportation
45 Transportation Bldg., P.O. Box 47314
46 Olympia, WA 98504-7314
47 or telephone - (360) 705-7085.
48 Fax (360) 705-6801
49

50 **(March 13, 1995)**

51 **Federal Agency Inspection**

52 Section 1-07.12 is supplemented with the following:
53

1 **Required Federal Aid Provisions**

2 The Required Contract Provisions Federal Aid Construction Contracts (FHWA 1273) and
3 the amendments thereto supersede any conflicting provisions of the Standard
4 Specifications and are made a part of this contract; provided, however, that if any of the
5 provisions of FHWA 1273, as amended, are less restrictive than Washington State Law,
6 then the Washington State Law shall prevail.

7
8 The provisions of FHWA 1273, as amended, included in this contract require that the
9 Contractor insert the FHWA 1273 and amendments thereto in each subcontract,
10 together with the wage rates which are part of the FHWA 1273, as amended. Also, a
11 clause shall be included in each subcontract requiring the subcontractors to insert the
12 FHWA 1273 and amendments thereto in any lower tier subcontracts, together with the
13 wage rates. The Contractor shall also ensure that this section, REQUIRED FEDERAL
14 AID PROVISIONS, is inserted in each subcontract for subcontractors and lower tier
15 subcontractors. For this purpose, upon request to the Project Engineer, the Contractor
16 will be provided with extra copies of the FHWA 1273, the amendments thereto, the
17 applicable wage rates, this Special Provision.

18
19 **Temporary Water Pollution/Erosion Control**

20 Section 1-07.15(1) is supplemented with the following:

21
22 (OR November 29, 2001)

23 **Spill Prevention, Control and Countermeasures Lead**

24 The Contractor shall designate at least one individual readily available to the work site
25 as the Spill Prevention, Control and Countermeasures (SPCC) Lead. This may be the
26 same person(s) designated as the Erosion and Sediment Control (ESC) Lead. The
27 SPCC Lead shall be identified by the Contractor at the pre-construction meeting. During
28 nonwork periods, the SPCC Lead shall be able to be on the job site within a 45 minute
29 time period after notification by the Engineer.

30
31 Duties of the SPCC Lead shall include, but are not limited to:

- 32
33 1. Making Contracting Agency initiated revisions to the approved SPCC Plan as
34 part of the Contractor's water pollution prevention planning.
35 2. Ensuring the spill kits(s), as specified in the Contractor's SPCC Plan, are on the
36 project site during all working hours.
37 3. Coordinating spill response and oversight of control measures.
38 4. Functioning as the Contractor's designated reporter for spills.
39 5. Preparing, implementing, and updating a SPCC plan and maintaining a SPCC
40 File. The SPCC File shall also include reporting of any preventative planning
41 measures and responses to an event. The current SPCC plan and File shall be
42 made available to the Engineer for review upon request.
43 6. Coordination with the Erosion and Sediment Control Lead (if a different person)
44 to oversee implementation of the SPCC Plan and TESC Plan/FDCP.

45
46 **MEASUREMENT**

47 SPCC Lead will be measured by the day, for each day that a spill response is made and
48 a report is filed.

49
50 Section 1-07.15(1) **PAYMENT** is supplemented with the following:

51
52 "SPCC Lead" per day.
53

1 **Protection And Restoration Of Property**

2 Section 1-07.16 is supplemented with the following:

3
4 **(March 13, 1995)**

5 **Archaeological And Historical Objects**

6 It is national and state policy to preserve, for public use, historical and prehistorical
7 objects such as ruins, sites, buildings, artifacts, fossils, or other objects of antiquity that
8 may have significance from a historical or scientific standpoint.

9
10 Archaeological or historical objects, which may be encountered by the Contractor, shall
11 not be further disturbed. The Contractor shall immediately notify the Engineer of any
12 such finds.

13
14 The Engineer will contact the archaeologist who will determine if the materials is to be
15 salvaged. The Contractor may be required to stop work in the vicinity of the discovery
16 until such determination is made. If the archaeologist determines that the material is to
17 be salvaged, the Engineer may require the Contractor to stop work in the vicinity of the
18 discovery until the salvage is accomplished.

19
20 Loss of time suffered by the Contractor due to resulting delays will be adjusted in
21 accordance with Section 1-08.8.

22
23 **(February 5, 2001)**

24 **Utilities And Similar Facilities**

25 Section 1-07.17 is supplemented with the following:

26
27 Locations and dimensions shown in the Plans for existing facilities are in accordance
28 with available information obtained without uncovering, measuring, or other verification.

29
30 Public and private utilities, or their contractors, will furnish all work necessary to adjust,
31 relocate, replace, or construct their facilities unless otherwise provided for in the Plans or
32 these Special Provisions. Such adjustment, relocation, replacement, or construction will
33 be done during the prosecution of the work for this project.

34
35 The following addresses and telephone numbers of utility companies known or
36 suspected of having facilities within the project limits are supplied for the Contractor's
37 convenience:

38
39 TCI Northwest, Inc
40 20811 84th Avenue South
41 Kent, WA 98032
42 Attn: Mike Miller
43 (206) 396-6029

44
45 City of Puyallup
46 100 39th SE
47 Puyallup, WA 98374
48 Attn: Marvin Cox
49 (206) 841-5505

50
51 Williams Communication, Inc.

1 110 West 7th Suite 500 (Mgr. of Land Records)
2 Tulsa, OK 74119-1044
3 Attn: Bobby Lambert
4 (360) 923-2344
5

6 Puget Sound Energy
7 3130 S 38th ST.
8 Tacoma, WA 98409
9 Attn: Cheryl Paras
10 (253) 476-6315
11

12 Washington State Department of Transportation
13 Olympic Region
14 5720 Capital Boulevard
15 Tumwater, WA 98501
16 Attn: Don Anders
17 (360) 357-2616
18

19 When contacting the One-Number Locator Service, please specify that locates are for a
20 State Project.
21

22 **Public Convenience and Safety**

23 ***Construction Under Traffic***

24 Section 1-07.23(1) is supplemented with the following:
25

26 (*****)
27

28 There shall be no restrictions or interruptions to traffic on the day prior to a
29 holiday or holiday weekend through the last day of the holiday or holiday
30 weekend.
31

32 Lane restrictions shall be held to a minimum time and length needed for each
33 operation. If the Engineer determines that the lane restrictions are causing
34 congestion, the Contractor will be required to open all lanes to traffic until the
35 congestion is eliminated.
36

37 Work hours for lane or ramp restrictions shall be daily from 8:00 AM until 5:00
38 PM.
39

40 Should high volume hours differ from those specified, as determined by the
41 Engineer, the Contractor will be required to adjust the hours of work accordingly.
42 Exceptions to these restrictions may be considered by the engineer on a case by
43 case basis following a written request by the Contractor.
44

45 When the Contractors construction operations are actually in progress, traffic
46 may be restricted to one lane, subject to the above specifications.
47

48 Special events that generate increased traffic volumes through the work area
49 may occur during the life of this project. Lane restrictions may be denied if
50 severe traffic congestion is expected. The dates for these Special Events are:
51

52 High School Graduations	June 15-18
53 Meeker Days	June 21-23

Region 5 Arabian Horse	July 3-8
Good Guys Car Show	July 20-23
Fall Fair	September 6-22

There shall be no delay to medical, fire, police, or other emergency vehicles with flashing lights or sirens. The Contractor shall alert all flaggers and personnel of this requirement.

(*****)

The construction safety zone will be determined as follows:

When the posted speed is 35MPH or under, the safety zone will be 10 feet from the outside edge of traveled way or 2 feet beyond the outside edge of the sidewalk.

When the posted speed is from 40-55 MPH the safety zone will be 15 feet from the outside edge of traveled way.

When the posted speed is over 55 MPH the safety zone will be 30 feet from the outside edge of traveled way.

During nonworking hours equipment or materials shall not be within the safety zone unless it is protected by permanent guard rail or temporary concrete barrier. The use of temporary concrete barrier shall be permitted only if the Engineer approves the installation and location.

During the actual hours of work, unless protected as described above, only materials absolutely necessary to construction shall be within the safety zone and only construction vehicles absolutely necessary to construction shall be allowed within the safety zone or allowed to stop or park on the shoulder of the roadway.

The Contractor's nonessential vehicles and employees private vehicles shall not be permitted to park within the safety zone at any time unless protected as described above.

Deviation from the above requirements shall not occur unless the Contractor has requested the deviation in writing and the Engineer has provided written approval.

PROSECUTION AND PROGRESS

Subcontracting

Section 1-08.1 is supplemented with the following:

(October 12, 1998)

Prior to any subcontractor or lower tier subcontractor beginning work, the Contractor shall submit to the Engineer a certification (WSDOT Form 420-004) that a written agreement between the Contractor and the subcontractor or between the subcontractor and any lower tier subcontractor has been executed. This certification shall also guarantee that these subcontract agreements include all the documents required by the Special Provision **Federal Agency Inspection**.

1 A subcontractor or lower tier subcontractor will not be permitted to perform any work
2 under the contract until the following documents have been completed and submitted to
3 the Engineer:
4

- 5 1. Request to sublet work (Form 421-012), and
- 6 2. Contractor and subcontractor or Lower Tier Subcontractor Certification for
7 Federal-aid Projects (Form 420-004).
- 8

9 The Contractor's records pertaining to the requirements of this Special Provision shall be
10 open to inspection or audit by representatives of the Contracting Agency during the life
11 of the contract and for a period of not less than three years after the date of acceptance
12 of the contract. The Contractor shall retain these records for that period. The Contractor
13 shall also guarantee that these records of all subcontractors and lower tier
14 subcontractors shall be available and open to similar inspection or audit for the same
15 time period.
16

17 **Progress Schedule**

18
19 (March 13, 1995)

20 The third sentence of the second paragraph of Section 1-08.3 is revised to read as follows:
21

22 The schedule shall be developed by a critical path, bar graph, or similar type method.
23

24 **Time For Completion**

25
26 (March 13, 1995)

27 Section 1-08.5 is supplemented with the following:
28

29 This project shall be physically completed within *** 30 *** working days.
30

31 **Liquidated Damages**

32
33 Section 1-08.9 is supplemented with the following:
34

35 (*****)

36 The Contracting Agency will assess liquidated damages for failure to open all lanes to
37 traffic in each direction during the hours specified in the Special Provisions **PUBLIC**
38 **CONVENIENCE AND SAFETY** in accordance with the following:
39

40 \$1000 liquidated damages per 15 minutes for each 15-minute period prorated to
41 the nearest 5 minutes that a lane is closed on SR 512 beyond the scheduled
42 opening time.
43

44 \$500 liquidated damages per 15 minutes for each 15-minute period prorated to
45 the nearest 5 minutes that the northbound SR 512 ramp to SR 167 is closed
46 beyond the scheduled opening time.
47

48 \$200 liquidated damages per 15 minutes for each 15-minute period prorated to
49 the nearest 5 minutes that the southbound SR 167 ramp to SR 512 is closed
50 beyond the scheduled opening time.
51

\$300 liquidated damages per 15 minutes for each 15-minute period prorated to the nearest 5 minutes that the northbound on ramp from SR 161 to SR 512 is closed beyond the scheduled opening time.

\$50 liquidated damages per 15 minutes for each 15-minute period prorated to the nearest 5 minutes that either the southbound on ramp to SR 512 from Meridian Ave or the northbound SR 512 off ramp to Meridian is closed beyond the scheduled opening time.

These charges are in addition to the formula calculated liquidated damages for failure to physically complete the entire project within the allotted time.

TEMPORARY TRAFFIC CONTROL

General

Section 1-10.1 is supplemented with the following:

(OR January 19, 1999)

The Contractors work vehicle movements shall be conducted as normal and legal traffic movements. The Contractors ingress and egress of the work area shall be accomplished with as little disruption to traffic as possible. Traffic control devices shall be removed in reverse order by picking up the devices in a reverse sequence to that used for installation. This may require moving backwards through the workzone.

Traffic Control Management

General

(April 7, 2003)

Section 1-10.2(1) is supplemented with the following:

The Traffic Control Manager and Traffic Control Supervisor shall be certified by one of the following:

The Northwest Laborers-Employers Training Trust
27055 Ohio Ave.
Kingston, WA 98346
(360) 297-3035

Evergreen Safety Council
401 Pontius Ave. N.
Seattle, WA 98109
1-800-521-0778 or
206-382-4090

Traffic Control Plans

(September 30, 1996)

The last sentence of Section 1-10.2(2) is revised to read:

SR 512
VIC. SOUTH HILL TO SR 167 I/C

The Contractor's letter designating and adopting the specific traffic control plan(s) or any proposed modified plans(s) shall be submitted to the Engineer for approval at least ten calendar days in advance of the time the new plan will be implemented.

Section 1-10.2(2) is supplemented with the following:

(OR January 19, 1999)

These traffic control plans are intended to operate without the use of flaggers or spotters for the mainline traffic control. The use of flaggers or spotters to supplement the traffic control plans will not be allowed except in a case where no other means of traffic control can be used or in the event of an emergency.

If the Contractor proposes the use of flaggers or spotters, this will constitute a modification to the traffic control plans requiring approval by the engineer. The Modified plans must show locations for all the required advance warning signs and a safe, protected and illuminated location for the flagging station.

Conformance To Established Standards

Section 1-10.2(3) is supplemented with the following:

(April 30, 2001)

The following devices are deemed compliant with the crashworthiness requirements of NCHRP 350 and are approved for use on the project:

Approved Category II Devices

Type I and II Barricades

<u>Manufacturer</u>	<u>Model Number</u>
WLI Industries	Safety Cade Type II
Bent Manufacturing	Unicade
Bent Manufacturing	Waffle Barricade
Bent Manufacturing	Type II Plywood or Plastic Panel
Eastern Metal	Type I & II Barricades
Plasticade Products	Fibercade Type II
Plasticade Products	Plasticade Type II
Dicke Tool Company	Type I Plastic Barricade
TraFFix Devices, Inc.	Plastic Folding Type I Barricade
The Roadmaker Company	Type II Plastic Barricade
Thee D Traffic Works, inc.	TD2000 Works Barricade
Protection Services, Inc.	Type I & II Barricade
Flex-O-Lite	Type I Barricade
United Rentals Highways	Type I & II Barricades
Bureau of Highway Safety	Penn. Type III Barricade
The Cortina Companies	Type I Plastic Barricades

Type III Barricades

<u>Manufacturer</u>	<u>Model Number</u>
Bent Manufacturing	Type III baricade
Recycled Plastic Products	Hollow Core Plastic Barricade
Yodock Wall Company	2001m Type III Barricade
Cantel of Medford, Inc.	EZ-UP Type III Barricade

Approved Portable Signs and Stands

Manufacturer	Model Number
Montana DOT	DWG# 618-02 (Plywood)
WLI	SafetyCor Sign System (Plastic)
Texas DOT	Skid Mounted Sign Support (Plywood)
Reflexite/Eastern Metals	DF 400 & DF 4700 TX (Endurance plastic)

(Aluminum signs are not approved for use the above listed stands at this time)

Flagging, Signs, And All Other Traffic Control Devices***Traffic Control Labor***

The last sentence of the second paragraph of Section 1-10.3(1) is revised to read:

(OR January 19,1999)

The contractor shall furnish conventional Stop/Slow Paddles (24 inches wide, letters 8 inches high and reflectorized) for flagging operations.

Construction Signs

(April 7, 2003)

Section 1-10.3(3) is revised to read as follows:

All signs required by the approved traffic control plan(s) as well as any other appropriate signs prescribed by the Engineer shall be furnished by the Contractor. The Contractor shall provide the posts or supports and erect and maintain the signs in a clean, neat, and presentable condition until the necessity for them has ceased. All non applicable signs shall be removed or completely covered with metal, plywood, or an Engineer approved product specifically manufactured for sign covering during periods when they are not needed. When the need for these signs has ceased, the Contractor, upon approval of the Engineer, shall remove all signs, posts, and supports from the project and they shall remain the property of the Contractor.

All orange background signs shall utilize materials, and be fabricated in accordance with, Section 9-28. All orange background signs shall be fabricated with Type X fluorescent orange sign sheeting.

All post mounted signs with Type X sheeting shall use a nylon washer between the twist fasteners (screw heads, bolts, or nuts) and the reflective sheeting.

There shall be no intermixing of signs with non-fluorescent orange reflective sign sheeting and signs with fluorescent orange reflective sign sheeting on the same sign post.

Construction signs will be divided into two classes. Class A construction signs are those signs that remain in service throughout the construction or during a major phase of the work. They are mounted on posts, existing fixed structures, or substantial supports of a semi-permanent nature. Sign and support installation for Class A signs shall be in accordance with the Contract Plans or the Standard Plans. Class B

construction signs are those signs that are placed and removed daily, or are used for short duration which may extend for one or more days. They are mounted on portable or temporary mounting. In the event of disputes, the Engineer will determine if a construction sign is considered as a Class A or B construction sign.

If it is necessary to add weight o signs for stability, only a bag of sand that will rupture on impact shall be used. The bag of sand shall: (1) be furnished by the Contractor, (2) have a maximum weight of 40 pounds, and (3) be suspended no more than 1 foot from the ground.

Payment for setup and take down of Class B signs will be limited to the labor cost to do the work described in Section 1-10.3(1), and for transportation described in Section 1-10.3(2).

Signs, posts, or supports that are lost, stolen, damaged, destroyed, or which the Engineer deems to be unacceptable while their use is required on the project, shall be replaced by the Contractor without additional compensation.

(April 28, 1997)

Section 1-10.3(3) is supplemented with the following:

Wood Sign Posts

Use the below charts to determine post size for Class A construction signs.

One Post Installation

<u>Post Size</u>	<u>Min. Sign Sq. Ft.</u>	<u>Max. Sign Sq. Ft.</u>
4X4	-	16.0
4X6	17.0	20.0
6X6	21.0	25.0
6X8	26.0	31.0

Two Post Installation

(For signs 5 feet or greater in width)

4x4	-	16.0
4x6	17.0	36.0

*The Engineer shall determine post size for signs greater than 75 square feet.

Temporary Traffic Control Devices

(March 3, 1997)

The first sentence of Section 1-10.3(5) is revised to read:

When the bid proposal includes an item for "Temporary Traffic Control Devices", the work required for this item shall be furnishing Class B construction signs, barricades, flashers, cones, traffic safety drums, and other temporary traffic control devices, unless the contract provides for furnishing a specific temporary traffic device under another item.

Section 1-10.3(5) is supplemented with the following:

(*****)

Sequential Arrow Sign

The MUTCD requirements are supplemented with the following:

Sequential arrow signs furnished for this project shall be Type ***C***.

The color of the light emitted shall be yellow.

The power source for the sign shall be capable of operating the lamps at their optimum light level for the entire period of operation. The power source will be subject to the approval of the Engineer prior to use.

A control panel, using solid-state circuitry, shall be enclosed in a ventilated, vandal-resistant box. A photoelectric control, with manual override, shall automatically dim the lights during hours of darkness. Arrow panels shall be capable of a minimum of 50 percent dimming from their rated lamp voltage.

(February 5, 2001)

Traffic Safety Drums

Traffic safety drums shall be manufactured specifically for traffic control purposes, and shall be fabricated from low density polyethylene that maintains its integrity upon impact.

The drums shall be of the following general specifications:

Overall Height	36 inches minimum
Overall Width	18 inch minimum in the direction(s) of traffic flow. If the front to back dimension is less than 18 inches, only those drums specifically approved by the Engineer will be permitted.
Shape	Rectangular, hexagonal, circular, or flat-sided semi-circular.
Color	The base color of the drum shall be fade resistant safety orange.
Reflective Stripes	The exterior vertical surface shall have at least two orange and two white circumferential stripes. Each stripe shall be 4 to 6 inches wide and shall be reflectorized. If there are nonreflectorized spaces between the horizontal orange and white stripes they shall be no more than 2 inches wide. Reflective stripes shall be 3-M flexible 3810, Reflexite PC 1000, 3-M Diamond Grade, or Avery Dennison W-6100

The traffic safety drums shall be designed to accommodate at least one portable light unit. The method of attachment shall ensure that the light does not separate from the drum upon impact, and shall meet the requirements of NCHRP 350 as certified by the manufacturer of the device. The Contractor shall obtain the manufacturer's certification

documentation for all such devices purchased and shall keep the documentation available for inspection throughout the life of the project.

When recommended by the manufacturer, drums shall be treated to ensure proper adhesion of the reflective sheeting.

If approved by the Engineer, used drums with new reflective sheeting may be used, provided all drums used on the project are of essentially the same configuration.

The drums shall be designed to resist overturning by means of a weighted lower unit that will separate from the drum when impacted by a vehicle. The lower unit shall be a maximum of 4 inches high and shall be designed to completely enclose the ballast. The lower unit, with ballast, shall have a minimum weight of 10 pounds and maximum weight of 50 pounds. The base shall be designed to resist movement or creeping from wind gusts or other external forces. The drums shall be designed to resist rolling if overturned. Drums shall be regularly maintained to ensure that they are clean and that the drum and reflective material are in good condition. If the Engineer determines that a drum has been damaged beyond use, or provides inadequate reflectivity, a new drum shall be furnished.

When no longer required, as determined by the Engineer, the drums shall remain the property of the Contractor and shall be removed from the project.

(April 1, 2002)

Truck Mounted Impact Attenuator (TMA)

The TMA shall be mounted on a vehicle with a minimum weight of 15,000 pounds and a maximum weight in accordance with the manufacturers recommendations. Ballast used to obtain the minimum weight requirement, or any other object that is placed on the vehicle shall be securely anchored such that it will be retained on the vehicle during an impact. The Contractor shall provide certification that the unit complies with NCHRP 230 or 350 requirements. TMA's may be selected from the approved TMA's listed on the Qualified Products List.

The Contractor shall have a spare TMA and operator (if necessary) available to replace a damaged or disabled TMA. Replacement shall be accomplished as soon as the damaged TMA has been removed. The Contractor shall immediately repair to the manufacturer's specifications, all damage to a TMA not deemed extensive enough to warrant replacement as determined by the Engineer.

The TMA shall have an adjustable height so that it can be placed at the correct elevation during usage and to a safe height for transporting. If needed, the Contractor shall install additional lights to provide fully visible brake lights at all times.

The TMA unit shall have a chevron pattern on the rear of the unit. The standard chevron pattern shall consist of 4-inch yellow stripes, alternating non-reflective black and reflective yellow sheeting, slanted at 45 degrees in an inverted "V" with the "V" at the center of the unit.

The TMA shall be positioned to separate and protect construction zone work activities from normal traffic flow.

During use, the attenuator shall be in the full down-and-locked position. For stationary operations, the truck's parking brake shall be set.

(*****)

Type III Barricade

The barricades shall be constructed in accordance with the details shown in the MUTCD and the Standard Plans. The barricade width shall be *** 8 feet ***. If it is necessary to add mass to barricades for stability, only bags of sand that will rupture on impact shall be used. The bags of sand shall:

1. Be furnished by the Contractor.
2. Have a maximum mass of 40 pounds.
3. Be placed no more than 1 foot above the ground.

As may be indicated in the Signing Plan or Traffic Control Plan, the Contractor may be required to install signs, warning lights, or both, on barricades.

(February 17, 1998)

Portable Changeable Message Sign (PCMS)

The PCMS shall meet the requirements of the MUTCD and the following:

The PCMS shall employ one of the following technologies:

1. Back-lighted split-flap
2. Fiber optic/shutter
3. Light emitting diode
4. Light emitting diode/shutter
5. Flip disk

Regardless of the technology, the PCMS shall meet the following general requirements:

1. Be light emitting and must not rely solely on reflected light.
2. Have a display consisting of individually controlled pixels no larger than 2 1/2 inch by 2 1/2 inch. If the display is composed of individual character modules, the space between modules must be minimized so alphanumeric characters of any size specified below can be displayed at any location within the matrix.
3. When activated, the pixels shall display a yellow or orange image. When not activated, the pixels shall display a flat black image that matches the background of the sign face.
4. Be capable of displaying alphanumeric characters that are a minimum of 18 inches in height. The width of alphanumeric characters shall be appropriate for the font. The PCMS shall be capable of displaying three lines of eight characters per line with a minimum of one pixel separation between each line.
5. The PCMS message, using 18 inch characters, shall be legible by a person with 20/20 corrected vision from a distance of not less than 800 feet centered around an axis perpendicular to the sign face.

6. The sign display shall be covered by a stable, impact resistant polycarbonate face. The sign face shall be non-glare from all angles and shall not degrade due to exposure to ultraviolet light.
7. Be capable of simultaneously activating all pixels for the purpose of pixel diagnostics. Any sign that employs flip disk or shutter technology shall be programmable to activate the disks/shutters once a day to clean the electrical components. This feature shall not occur when the sign is displaying an active message.
8. The light source shall be energized only when the sign is displaying an active message.
9. Be equipped with a redundant light source such that the sign will continue to emit light if one of the light sources fails.

The PCMS panels and related equipment shall be permanently mounted on a trailer with all controls and power generating equipment.

The PCMS shall be operated by an easy to use controller that provides the following functions:

1. Select any preprogrammed message by entering a code.
2. Sequence the display of at least five messages.
3. Blank the sign.
4. Program new message, which may include moving arrows and chevrons.
5. Mirror the message currently being displayed or programmed.

Portable changeable message signs(s) shall be available, on site, for the life of the project.

The Contractor shall operate the PCMS in accordance with the approved traffic control plans or as directed by the Engineer. The PCMS shall not be used in lieu of sequential arrow signs.

Measurement

(June 3, 1996)

The third paragraph of Section 1-10.4 is revised to read:

Class A construction signs will be measured by the square foot of panel area. A Class A construction sign may be used in more than one location and will be measured for payment for each new installation. Sign posts or supports will not be measured for payment.

Section 1-10.4 is supplemented with the following:

(September 30, 1996)

Measurement will be by the hour of operation for sequential arrow sign. The hours of operation will be determined by the Engineer. Operation over and above those hours shall be at the Contractor's expense.

1 (September 30, 1996)

2 Truck mounted impact attenuators will be measured per each one time only for each
3 truck with mounted impact attenuator used on the project. The final pay quantity shall be
4 the maximum number of TMAs in place at any one time.

5
6 Operation of truck mounted impact attenuator will be measured by the hour when
7 manned and operated. Manned and operated shall be when the TMA has an operator
8 and is required to move, in operating position, with the construction operation or when
9 moving the TMA from one position to another on the project.

10
11 (January 5, 1998)

12 Portable changeable message signs will be measured per each one time only for each
13 PCMS used on the project. The final pay quantity shall be the maximum number of
14 PCMSs in place at any one time as approved by the Engineer.

15
16 Operation of portable changeable message sign will be measured by the hour for each
17 hour of operation. The hours of operation will be determined by the Engineer. Hours of
18 operation in excess of those determined by the Engineer will be at the Contractors
19 expense.

20 21 **Payment**

22
23 (June 3, 1996)

24 Payment for construction signs Class A in Section 1-10.5 is revised to read:

25
26 "Construction Signs Class A", per square foot of panel area.

27
28 The unit contract price per square foot of panel area shall be full pay for all costs to
29 furnish and install the Class A construction signs in accordance with Sections 1-10.3(3)
30 and 1-10.3(4). This payment will include all signs, labor, equipment, and vehicles
31 necessary for the installation of Class A signs. Payment will not be made for signs
32 delivered to the project without the approval of the Engineer.

33
34 Section 1-10.5 is supplemented with the following:

35
36 (September 30, 1996)

37 "Sequential Arrow Sign", per hour.

38
39 (September 30, 1996)

40 "Truck Mounted Impact Attenuator", per each.

41 The unit contract price per each for "Truck Mounted Impact Attenuator" shall be full pay
42 for furnishing a truck with impact attenuator attached (TMA), transporting the TMA to and
43 from the project, and when the TMA is in use but not manned.

44
45 "Operation of Truck Mounted Impact Attenuator", per hour.

46 The unit contract price per hour for "Operation of Truck Mounted Impact Attenuator"
47 shall be full pay for each hour the TMA is manned and operated.

48
49 "Repair Impact Attenuator", by force account.

50 All costs of repairing or replacing TMA's damaged by the motoring public will be paid for
51 by force account as specified in Section 1-09.6. To provide a common proposal for all
52 bidders, the Contracting Agency has estimated the amount of force account for "Repair
53 Impact Attenuator" and has entered the amount in the Proposal to become a part of the

total bid by the Contractor. TMA's damaged due to the Contractor's operation shall be repaired or replaced by the Contractor at no expense to the Contracting Agency.

(October 12, 1998)

"Portable Changeable Message Sign", per each.

The unit contract price per each for "Portable Changeable Message Sign" will be full pay for furnishing the PCMS, including transporting the PCMS to and from the project.

"Operation of Portable Changeable Message Sign" per hour.

The unit contract price per hour for "Operation of Portable Changeable Message Sign" will be full pay for each hour the PCMS is in operation at an approved location, including all maintenance costs. Relocation of the PCMS within the project limits will be paid in accordance with Section 1-10.3(1) and 1-10.3(2).

DIVISION 2 EARTHWORK

REMOVAL OF STRUCTURES AND OBSTRUCTIONS

Description

Section 2-02.1 is supplemented with the following:

(March 13, 1995)

This work shall consist of removing miscellaneous traffic items.

Construction Requirements

Section 2-02.3 is supplemented with the following:

(March 13, 1995)

Removing Miscellaneous Traffic Items

The following miscellaneous traffic items shall be removed and disposed of:

Flexible Guide Post	Approx. 35 Each
Plastic Wide Line	Approx. 1110 Linear Feet
Plastic Drainage/Junction Box Marker	Approx. 35 Each
Plastic Aerial Surveillance Full Marker	Approx. 1 Each
Raised Pavement Marker Type 1 and 2	Approx. 8.8 Hund

Payment

(September 30, 1996)

"Removing Miscellaneous Traffic Item", lump sum.

DIVISION 4 BASES

BALLAST AND CRUSHED SURFACING

Description

Section 4-04.1 is supplemented with the following:

(*****)

Shoulder Finishing

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1 This work consists of placing bituminous pavement planings or crushed surfacing base
2 course along the edge of each shoulder.
3

4 **Materials**

5 Section 4-04.2 is supplemented with the following:
6

7 (*****)

8 Crushed Surfacing Base Course used in shoulder finishing will be accepted by the
9 Engineer based upon satisfactory performance of the material for its intended use. The
10 material may be tested at the discretion of the Engineer.
11

12 **Construction Requirements**

13 Section 4-04.3 is supplemented with the following:
14

15 (*****)

16 After paving the top lift of asphalt concrete, crushed surfacing base course or planings
17 shall be placed against the vertical edge of the pavement. It shall be graded into place
18 and compacted by approved compaction equipment with a minimum of two passes. For
19 compaction, water shall be applied as determined by the Engineer.
20

21 Following the construction of shoulder finishing, the paved shoulders shall be cleaned of
22 all dirt and debris to the satisfaction of the Engineer.
23

24 **Measurements**

25 Section 4-04.4 is supplemented with the following:
26

27 (*****)

28 Shoulder finishing will be measured to the nearest 0.01 mile along each shoulder
29 finished.
30

31 **Payment**

32 Section 4-04.5 is supplemented with the following:
33

34 (*****)

35 "Shoulder Finishing", per mile
36

37 **DIVISION 5** 38 **SURFACE TREATMENTS AND PAVEMENTS** 39

40 **ASPHALT CONCRETE PAVEMENT**

41 **Construction Requirements**

42
43
44 Section 5-04.3 is supplemented with the following:
45

46 (OR January 19, 1999)

47 **Materials Transfer Device**

48 A material transfer device (MTD) shall be required to deliver the asphalt concrete mixture from
49 the hauling conveyance to the paving machine when placing the wearing course of asphalt
50 concrete pavement on the traffic lane, including lanes for ramps, truck climbing, weaving, and
51 speed change. The MTD shall be used for shoulder paving when the shoulders are paved in
52 conjunction with the traffic lanes.
53

1 MTD's may be either self propelled or attached to the paving machine.

2
3 The MTD shall have a hopper to receive asphalt concrete mixture from the hauling conveyance.

4
5 The combined holding capacity of the MTD and paving machine hoppers shall be a minimum 15
6 tons.

7
8 Additional mixing of the asphalt concrete mixture shall be done using either augers or paddles.
9 Additional mixing can be done either in the MTD or paving machine hopper. Mixing done by the
10 distributing augers of the paving machine shall not be considered as additional mixing.

11
12 Prior to use, the Contractor shall submit to the Engineer for review and approval, the
13 manufacturer and model number of the MTD. All costs to incorporate the MTD into the paving
14 train shall be included in the associated pay items.

15 16 **Crack Sealing**

17 Section 5-04.3(5)C is supplemented with the following:

18
19 (OR September 28, 2000)

20 The Contractor shall not use rubberized asphalt to perform crack sealing on this
21 contract.

22 23 **Pavement Repair**

24 Section 5-04.3(5)E is supplemented with the following:

25
26 (OR January 1, 1999)

27 The minimum excavation depth for pavement repair is ***0.5*** feet.

28 29 **Joints**

30 Section 5-04.3(11) is supplemented with the following:

31
32 (March 13, 1995)

33 The asphalt concrete pavement overlay, shall be feathered to produce a smooth riding
34 connection to the existing pavement.

35
36 Asphalt concrete pavement Class *** A PG 58-22 ***, utilized in the construction of the
37 feathered connections, shall be modified by eliminating the coarse aggregate from the
38 mix at the Contractor's plant or the commercial source or by raking the joint on the
39 roadway, to the satisfaction of the Engineer.

40 41 **Planing Bituminous Pavement**

42 Section 5-04.3(14) is supplemented with the following:

43
44 (*****)

45 Prior to beginning the planing operations, the Contractor shall submit a method of
46 operation to the Engineer for approval.

47
48 Prior to planing, all existing drainage, utility, and monument structures within the planing
49 area shall be lowered in accordance with the Special Provisions **MANHOLES, INLETS,**
50 **CATCH BASINS, AND DRYWELLS, VALVES FOR WATER MAINS, and MONUMENT**
51 **CASES.** The Contractor is advised that not all obstructions may be shown in the Plans
52 and that the Contractor shall notify the appropriate Utility Location Request Center for
53 the location of facilities prior to planing.

The completed surface after planing and prior to paving shall not vary more than 1/4 inch from the lower edge of a 10-foot straightedge placed on the surface parallel or transverse to the centerline. The planed surface shall have a matted texture and the difference between the high and low of the matted surface shall not exceed 1/4 inch.

If at any time during the planing operation the Engineer determines the required surface tolerance is not being achieved, the Contractor will be required to stop planing. Planing shall not resume until the Engineer is satisfied that specification planing can be produced.

Pavement outside the horizontal and vertical limits shown in the plans damaged by the Contractor's operation shall be repaired to the satisfaction of the Engineer, at the Contractor's expense. Delamination or raveling of the underlying pavement shall not be construed as damage due to the Contractor's operation.

The planning's shall become the property of the Contractor and shall be removed from the project. The Contractor may utilize the planning's in the asphalt concrete pavement as specified in Section 5-04.2. All debris resulting from the planing operations shall be completely removed from the roadway and disposed of by the Contractor to the satisfaction of the Engineer. Unless otherwise provided, the Contractor shall provide a waste site for the disposal of these materials.

Planing depth will vary from 0.00' to 0.50' as specified in the Roadway Sections and Planing Details.

The Contractor shall not plane any area that cannot be paved with the leveling course of asphalt concrete pavement within the time (calendar days) specified below. Butt joint planing for the wearing course is exempt from these time restrictions and is subject to the approval of the Engineer.

SR 512 EB 470+65 TO SR 512 EB 529+12	one-day
--------------------------------------	---------

SR 512 WB 530+48 TO SR 512 WB 549+67	same shift
--------------------------------------	------------

SB 665+33 TO SR 167 364+00	same shift
----------------------------	------------

Pavement repair operations, when required, shall be accomplished prior to planing.

Crack sealing operations, where required, shall be accomplished following planing, and prior to paving.

(January 5, 1998)

Transverse Joints

The full depth end of each lane of planing shall be squared off to form a uniform transverse joint. The Contractor shall construct and maintain a temporary asphalt concrete wedge across the entire width of the transverse edge when traffic is allowed on the planed surface prior to paving. The wedge shall be constructed before opening the lane to traffic. The Contractor shall remove the wedge immediately prior to paving.

Measurement

Section 5-04.4 is supplemented with the following:

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(*****)

Planing bituminous pavement 0.50' depth will be measured by the square yard.

Payment

Section 5-04.5 is supplemented with the following:

(*****)

"Planing Bituminous Pavement 0.50' Depth", per square yard.

(OR March 15, 2002)

All costs to incorporate the MTD into the paving train shall be included in the unit contract price for "Asphalt Conc. Pavement Cl. _____" per ton.

DIVISION 7 DRAINAGE STRUCTURES, STORM SEWERS, SANITARY SEWERS, WATER MAINS, AND CONDUITS

MANHOLES, INLETS, CATCH BASINS, AND DRYWELLS

Construction Requirements.

Adjusting Manholes and Catch Basins to Grade

Section 7-05.3(1) is supplemented with the following:

(OR March 26, 2001)

The existing manholes, catch basins, and inlets shall be lowered prior to planning, and adjusted to the finished grade after the asphalt overlay is complete.

Manholes, catch basins, and inlets shall be lowered sufficiently to allow the planer to maintain a continuous profile and grad.

Manholes, catch basins, and inlets to be adjusted, shall have their lids and risers marked as identifiable pairs.

Debris from lowering and adjusting of the manholes, catch basins, and inlets shall be removed and disposed from the project.

To minimize pavement damage, the Contractor shall reference the location of each manhole, catch basin, and inlet to be adjusted. The Contractor may use location devices, offsets, or any locating method approved by the Engineer.

Payment

Section 7-05.5 is revised as follows:

(OR March 26, 2001)

The unit contract price per each for "Adjust Manhole", "Adjust Catch Basin", or "Adjust Inlet", shall be full pay for all costs necessary to make the adjustment including temporary lowering and final adjustments, locating, backfilling and restoration or adjacent areas in a manner acceptable to the Engineer.

DIVISION 8 MISCELLANEOUS CONSTRUCTION

EROSION CONTROL AND WATER POLLUTION CONTROL

Description

Section 8-01.1 is supplemented with the following:

(OR November 27, 2001)

This work shall consist of preparing a Fugitive Dust Control Plan (FDCP) in conjunction with the Temporary Erosion and Sediment Control (TESC) Plan and preparing for implementation of the plan.

Construction Requirements

General

Section 8-01.3(1) is supplemented with the following:

(OR November 27, 2001)

Fugitive Dust Control Plan

The Contractor shall be responsible for the preparation of the FDCP to be used for the duration of the project. The plan shall be submitted to the Project Engineer prior to commencement of any construction activities. The Contractor will maintain a copy of the plan with any updates at the work site.

The FDCP shall outline what measures shall be taken by the Contractor to prevent fugitive dust from being released into the air at the work site.

The FDCP shall also address at a minimum, the following project specific information:

Introduction

Site Information

Management information, such as identification of Contractor personnel responsible for the FDCP, and contact person in case of a complaint.

Identification of all fugitive dust sources

Fugitive Dust control methods to be used for each fugitive dust source

Source and availability of materials to be used for controlling the fugitive dust

A schedule, rate of application, or calculation identifying how often, how much, and when the control method is to be used.

(OR November 29, 2001)

Erosion and Sediment Control (ESC) Lead

Section 8-01.3(1)B is supplemented with the following:

The Contractor shall designate at least one individual readily available to the project site as the Erosion and Sediment Control. Lead. This may be the same person designated as the Spill Prevention Control and Countermeasures (SPCC) lead.

In addition to those outline in section 8-01.3(1)B duties of the Erosion and Sediment Control Lead shall also include, but are not limited to:

1. Being responsible for the preparation of a Temporary Erosion and Sediment Control (TESC) Plan, to be used for the duration of the project, when a TESC Plan is not included in the contract plans.

2. Making Contracting Agency initiated revisions to the approved Temporary Erosion and Sediment Control (TESC) Plan and Fugitive Dust Control Plan (FDCP), maintaining both in a TESC file. The current TESC, FDCP Plan and file shall be made available to the Engineer for review upon request.
3. Coordinating with the SPCC Lead (if a different person) to oversee implementation of the SPCC Plan and TESC Plan.
4. Implementing the FDCP and inspecting the Best Management Practices (BMPs) for proper location and installation.
5. Preparing a FDCP Inspection Report for each inspection. The inspection reports shall be included in the TESC Plan/FDCP File maintained by the Contractor's Erosion and Sediment Control Lead. The inspection reports shall be made available to the Engineer upon request and shall include, but not be limited to the following:
 - a. The date and time BMPs are installed, removed, or changed;
 - b. The date and time maintenance is needed and performed;
 - c. The date, time, and person who performs inspection and maintenance, and what, if any maintenance is done;
 - d. Observations of BMP effectiveness and proper placement;
 - e. Recommendations for improving performance of BMPs.

Payment

Section 8-01.5 is supplemented with the following:

(OR November 27, 2001)

"Temporary Erosion and Sediment Control (TESC) Plan", per lump sum.

The lump sum contract price for the "Temporary Erosion and Sediment Control (TESC) Plan", which includes the "Fugitive Dust Control Plan (FDCP)", shall be full pay for all labor, equipment, material and overhead costs associated with the preparation of the TESC Plan and FDCP and any coordination and preparation needed prior to implementation.

There shall be no other payment for Dust Control Measures other than what is provided in Section 2-07.

GUARDRAIL

Construction Requirements

Section 8-11.3 is supplemented with the following:

Erection of Rail

The third paragraph in Section 8-11.3(1)C is revised to read:

(*****)

When nesting beam guardrail is specified, one new section set inside the existing guardrail section shall be installed. The inside and outside rail elements shall not be staggered. Nesting beam guardrail shall be performed at the locations specified in the Plans.

Measurement

Section 8-11.4 is supplemented with the following:

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1 (*****)

2 Measurement of nesting beam guardrail will be by the linear foot measured along the
3 line of the completed nested guardrail.

4
5 **Payment**

6 Section 8-11.5 is supplemented with the following:

7
8 (*****)

9 Nesting Beam Guardrail, per linear foot.

10
11 **MONUMENT CASES**

12
13 **Construction Requirements**

14 Section 8-13.3 is supplemented with the following:

15
16 (OR march 26, 2001)

17 ***Adjusting Monument Cases And Covers***

18
19 Where shown in the Plans or designated by the Engineer, the existing monument cases
20 and covers shall be lowered prior to planing, and adjusted to the finished grade after the
21 asphalt overlay is complete.

22
23 The existing cases and covers shall be removed and thoroughly cleaned for
24 reinstallation at the new elevation. The Contractor shall exercise care in removing the
25 existing monument cases and covers so as not to disturb the monument or damage the
26 case. Any part damaged due to the contractor's operations shall be replaced by the
27 Contractor at no expense to the Contracting Agency.

28
29 Monument cases and covers shall be lowered sufficiently to allow the planer to maintain
30 a continuous profile and grade.

31
32 The Contractor shall backfill and compact all voids resulting from lowering and adjusting
33 the monument cases and covers. Backfill material shall be approved by the Engineer.

34
35 The use of monument case riser rings will not be permitted.

36
37 Debris from lowering and adjusting the monument cases and covers shall be removed
38 and disposed from the project.

39
40 To minimize pavement damage, the Contractor shall reference the location of each
41 monument case to be adjusted. The Contractor may use location devices, offsets, or
42 any locating method approved by the Engineer.

43
44 **Measurement**

45 Section 8-13.4 is supplemented with the following:

46
47 (OR March 26, 2001)

48 Adjust monument case and covers will be measured per each.

49
50 **Payment**

51 Section 8-13.5 is supplemented with the following;

52
53 (OR March 26, 2001)

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1 "Adjust Monument Case and Cover," per each.

2
3 The unit contract price per each for "Adjust Monument Case and Cover" shall be full pay
4 for all costs necessary to make the adjustment including temporary lowering and final
5 adjustments, removal of debris, locating, backfilling and restoration of adjacent areas in
6 a manner acceptable to the Engineer.

8 **ILLUMINATION, TRAFFIC SIGNAL SYSTEMS, AND ELECTRICAL**

10 **Description**

11 Section 8-20.1 is supplemented with the following:

12
13 (OR May 4, 2001)

14 ***Adjust Junction Box***

15 This work shall consist of adjusting existing junction boxes to the finished grade as
16 staked or otherwise designated by the Engineer.

18 **Construction Requirements**

19 Section 8-20.3(1) is supplemented with the following:

20
21 (OR May 4, 2001)

22 The Contractor shall backfill and compact all voids resulting from adjusting the existing
23 junction boxes. Backfill material shall be approved by the Engineer.

24
25 Care shall be taken to prevent damaging the junction box. Any damage to the junction
26 box as a result of the Contractor's operations shall be repaired or replaced by the
27 Contractor at no expense to the Contracting Agency and to the satisfaction of the
28 Engineer.

30 **Measurement**

31 Section 8-20.4 is supplemented with the following:

32
33 (OR May 4, 2001)

34 "Adjust Junction Box", will be measured by the unit per each junction box adjusted to
35 finished grad.

37 **Payment**

38 Section 8-20.5 is supplemented with the following:

39
40 (OR May 4, 2001)

41 "Adjust Junction Box", per each

42
43 The unit contract price per each for "Adjust Junction Box" shall be full pay for all costs
44 necessary to make the adjustment including restoration of adjacent areas in a manner
45 acceptable to the Engineer.

47 **PAVEMENT MARKING**

49 **Description**

50 Section 8-22.1 the item Drainage Marking is supplemented with the following:

51
52 (May 4, 2001)

Drainage structure marking is a WHITE marking consisting of two 4 inch by 18 inch strips of plastic pavement marking material placed at the location of the drainage structure on the outside of the pavement edge stripe. The strips shall be configured so that they form a "T" with the stem towards the lane edge.

Description

Section 8-22.1 is supplemented with the following:

(*****)

Plastic Junction Box Marking

A WHITE marking consisting of two 4 inches by 12 inches strips of plastic pavement marking material placed at the location of a junction box, one foot outside the pavement edge stripe. The strips shall be configured so that they form an arrow with a 90 degree internal angle pointed at the junction box, overlapping at the point.

Measurement

Section 8-22.4 is supplemented with the following:

(*****)

Plastic junction box marking will be measured per each marking place.

Payment

Section 8-22.5 is supplemented with the following:

(*****)

The unit contract price per each for "Plastic Junction Box Marking" shall be full pay for performing the work as specified.

TEMPORARY PAVEMENT MARKINGS

(*****)

Section 8-23.1 is revised to read as follows:

Description

The work shall consist of furnishing, installing and removing temporary pavement markings. Temporary pavement markings shall be provided where noted in the Plans and for all lane shifts and detours resulting from construction activities. Temporary pavement markings shall also be provided when permanent markings are eliminated because of construction operations. Temporary pavement markings shall be maintained in serviceable condition throughout the project until permanent pavement markings are installed. Temporary pavement markings that are damaged shall be repaired or replaced immediately. Edge lines shall be installed only if specifically required in the contract.

Lane line and right edge line shall be white in color. Left edge line shall be yellow in color. All temporary pavement markings shall be retroreflective.

Temporary pavement marking installations are defined as described in Section 8-22.1.

Materials

Section 8-23.2 is revised to read:

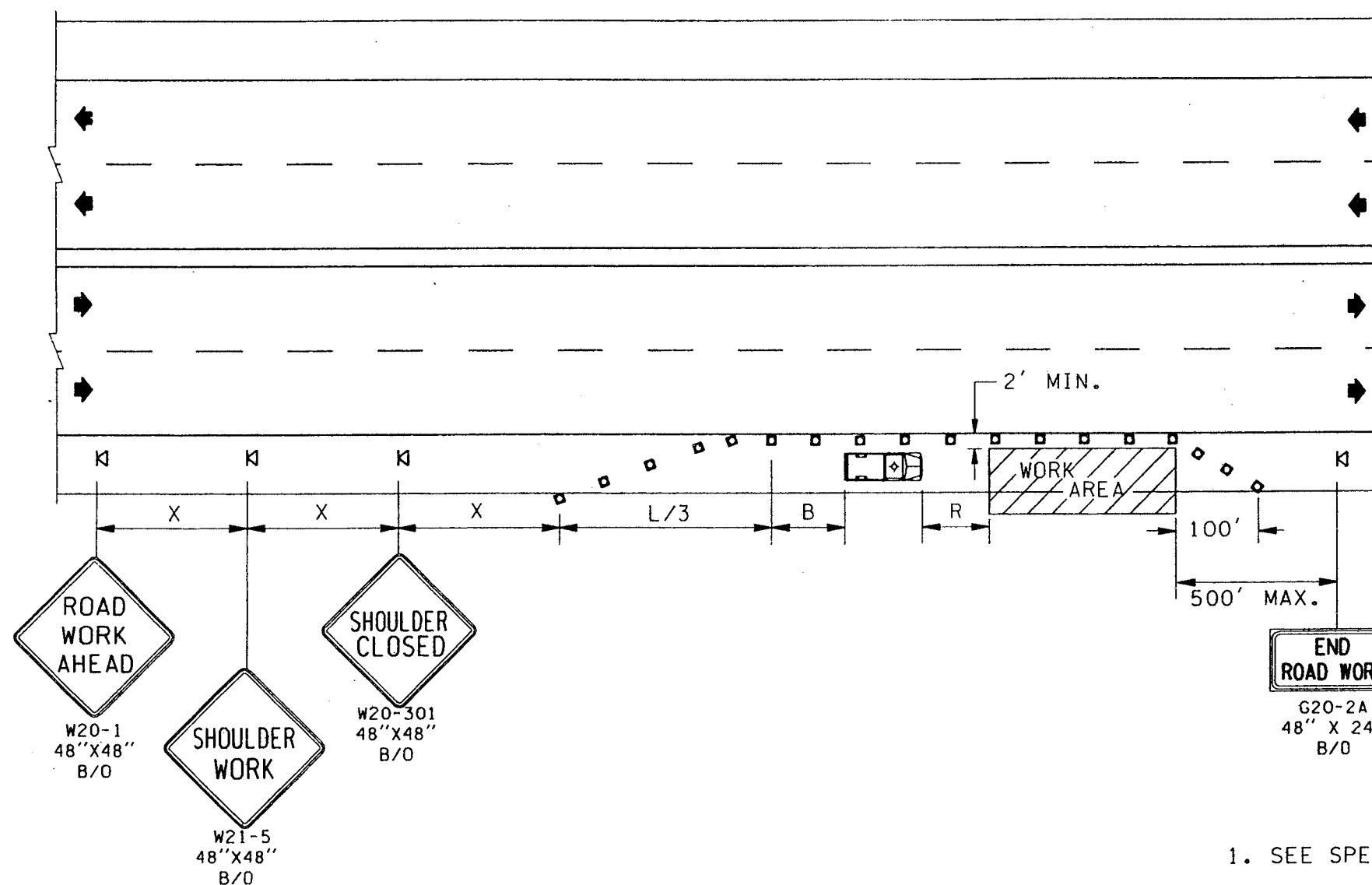
1 Materials for temporary pavement markings shall be, for the final lift, removable
2 preformed tape and selected from approved materials listed in the Qualified Products
3 List. Temporary Pavement Markings for planed areas shall be paint. For areas with a
4 leveling course, the markings shall be paint or foil.
5

6 **Measurement**

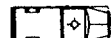
7 Section 8-23.4 is revised to read:
8

9 Removable preformed tape will be measured by the foot of the actual length of stripe
10 placed. The gaps between stripes will not be measured. Paint or foil shall be measured
11 by the foot including gaps.
12

13 No measurement will be made for the removal of temporary pavement markings.



LEGEND

- K SIGN LOCATION - TRIPOD MOUNT
- □ □ TEMPORARY TRAFFIC CONTROL DEVICES
-  PROTECTIVE VEHICLE - RECOMMENDED

SHOULDER CLOSURE - HIGH SPEED (40 MPH OR HIGHER)

BUFFER DATA											
BUFFER SPACE = B											
SPEED (MPH)	25	30	35	40	45	50	55	60	65	70	
LENGTH (feet)	55	85	120	170	220	280	335	415	485	585	
BUFFER VEHICLE ROLL AHEAD DISTANCE = R											
VEHICLE TYPE	TYPICAL VEHICLE LOADED WEIGHT (lbs)	POSTED SPEED (mph)		STATIONARY OPERATION (feet)		MOVING OPERATION (feet)					
4 YARD DUMP TRUCK	24,000	60-65		30							
		50-55		30							
		45		30							
2 TON CARGO TRUCK	15,000	60-65		30							
		50-55		30							
		45		30							
1 TON CARGO TRUCK	10,000	60-65		50							
		50-55		30							
		45		30							
ROLL AHEAD STOPPING SIGHT DISTANCE ASSUMES DRY PAVEMENT											

MINIMUM TAPER LENGTH = L (feet)										
LANE WIDTH (feet)	Posted Speed (mph)									
	25	30	35	40	45	50	55	60	65	70
10	-	-	-	270	450	500	550	-	-	-
11	-	-	-	295	495	550	605	660	-	-
12	-	-	-	320	540	600	660	720	780	840

SIGN SPACING = X (feet)		
Freeways & Expressways	55/70 MPH	1500'++ (OR AS PER MUTCD)
Rural Roads	45/55 MPH	500'++

CHANNELIZING DEVICE SPACING (feet)		
MPH	TAPER	TANGENT
50/70	40	80
35/45	30	60

GENERAL NOTES

1. SEE SPECIAL PROVISIONS FOR WORK HOUR RESTRICTIONS.
2. NO ENCROACHMENT ON TRAVELED LANE. IF ENCROACHMENT IS NECESSARY, LANE MUST BE CLOSED.
3. BUFFER VEHICLE RECOMMENDED - (MAY BE A WORK VEHICLE.)

FILE NAME	o:\DGN\SR512\15 CADD\pl506+cp.dgn			REGION NO.	STATE	FED.AID PROJ.NO.					PL019
TIME	08:08:52 AM			10	WASH	NH0512-(012)					TC9
DATE	03/18/2002			JOB NUMBER		LOCATION NO.					SHEET 34 OF 35 SHEETS
DESIGNED BY	D.WENTZ			CONTRACT NO.							
ENTERED BY	D.WENTZ										
CHECKED BY	C.COMPTON										
PROJ. ENGR.	J.WYNANDS										
REGIONAL ADM.	R.HAIN										
REVISION											
DATE											
BY											
P.E. STAMP BOX											
P.E. STAMP BOX											



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VIC. SOUTH HILL TO SR 167 I/C


TRAFFIC CONTROL PLAN

CONSTRUCTION SIGN SPECIFICATION SHEET

[illegible]

NOTES: POST LENGTHS SHOWN ARE APPROXIMATE. FINAL VALUES SHALL BE DETERMINED IN THE FIELD PRIOR TO FABRICATION.
FOR STRUCTURE AND MOUNTING DETAILS SEE STANDARD PLAN SHEET SERIES G.
FOR CODE REFERENCES AND STANDARD SIGN LAYOUT DETAILS SEE WASHINGTON STATE "SIGN FABRICATION MANUAL"
SEE SECTION 1-07.23(3) OF THE STANDARD SPECIFICATIONS.

* THE "W" DISTANCE SHALL BE MEASURED FROM THE EDGE OF EXISTING SHOULDER TO THE NEAR SIDE OF THE SIGN EDGE AS STAKED IN THE FIELD BY THE ENGINEER.

				REGION NO.	STATE	FED. AID PROJ. NO.	PROJECT DEVELOPMENT OFFICE	 Washington State Department of Transportation	SR 512 VIC. SOUTH HILL TO SR 167 I/C	TC10
DESIGNED BY	D. WENTZ	1/02		10	WASH	FILL-IN OR BLANK OUT				
ENTERED BY	D. WENTZ	1/02		<small>WSP, SR 512</small> 02C502						
CHECKED BY	G. COMPTON	1/02		CONTRACT NO.						
PROJ. ENGR.	J. WYNANDS									
REGIONAL ADM.	R. HAIN							CONSTRUCTION SIGN SPECIFICATION SHEET	SHEET 35 OF 35 SHEETS	
	DATE	DATE	REVISION	BY						



INDEX

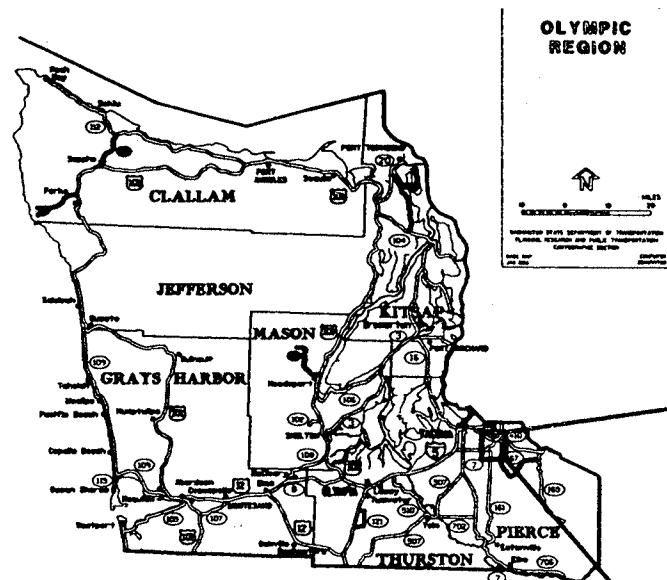
INDEX (CONTINUED)

[illegible][illegible]

PLAN REFERENCE NO.
SHEET OF SHEETS

NOTE: ALL SHEET REFERENCES, FIRST NOS. OF STRUCTURE CODE DESIGNATIONS AND MATCH LINE SHEET REFERENCES, ETC., THROUGHOUT THE PLANS, REFER TO THE ENTRY IN THE PLAN REFERENCE NUMBER BOX.

FILE NAME		O:\DGN\SR512\15 CADD\1506IND.DGN		REGION NO.		STATE		FED.AID PROJ.NO.				 Washington State Department of Transportation		SR 512 VIC. SOUTH HILL TO SR 167 I/C		PLOT1	
TIME		07:29:47 AM		10		WASH		NH0512-(012)								IND	
DATE		03/19/2002		JOB NUMBER		02C502		LOCATION NO.		DATE		DATE		INDEX		SHEET 1 OF 35 SHEETS	
DESIGNED BY		J. LOESCHER		CONTRACT NO.						P.E. STAMP BOX		P.E. STAMP BOX					
ENTERED BY		R. BAILEY															
CHECKED BY		D. HITCHCOCK															
PROJ. ENGR.		J. WYNANDS															
REGIONAL ADM.		R. HAIN		REVISION		DATE		BY									



OLYMPIC REGION

T19N R4E W.M.

T20N R4E W.M.

END FEDERAL AID #NH0512-(012)
END PROJECT

SR 167 MP 6.47=
SR 167 364+00

4.25 mi. TO
PACIFIC

PAVING EXCEPTION
SR 512 WB 549+60 TO
SB 645+80
MP 10.24 TO 12.06

BRIDGE 512/38
NOT INCLUDED IN PROJECT

BRIDGE 512/35 N&S
NOT INCLUDED IN PROJECT

BRIDGE 512/31 S
INCLUDED IN PROJECT

BRIDGE 512/33
NOT INCLUDED IN PROJECT

BRIDGE 512/31N
NOT INCLUDED IN PROJECT
BRIDGE 512/29N&S
NOT INCLUDED IN PROJECT

END CONSTRUCTION
SR 167 MP 6.17 RT.

PAVING EXCEPTION
SR 512 EB 529+12 TO
NB 11+00
MP 9.84 TO 11.78



W20-1
48"x48"
B/O



G20-2A
48"x24"
B/O

APPROXIMATE
LOCATIONS ON SR's
WB SR512 MP 7.32
WB SR512 MP 10.70
EB SR512 MP 11.05
SR161 24.65
SB SR167 MP 8.08
NB SR167 MP 5.65
WB SR410 MP 9.54
FIELD LOCATE ON 31ST AVE

APPROXIMATE
LOCATIONS ON SR's
WB SR512 MP 10.30
EB SR512 MP 8.80
EB SR512 MP 10.70
SR161 MP 25.19
SB SR167 MP 5.65
NB SR167 MP 6.30
FIELD LOCATE ON 31ST AVE

PUYALLUP CORPORATE LIMITS

PAVING EXCEPTION
SR 512 WB 470+65 TO 530+48
MP 8.76 TO 9.88

BEGIN FEDERAL AID #NH0512-(012)
BEGIN PROJECT
SR 512 EB 470+65 P.O.C.
SR 512 MP 8.76

8.77 mi. TO
LAKEWOOD

0 1000 2000
SCALE IN FEET

FILE NAME o:\DGN\SR512\5 CADD\506vic.dgn
TIME 07:32:11 AM
DATE 03/19/2002

DESIGNED BY D. HITCHCOCK / D. WENTZ
ENTERED BY R. BAILEY / D. WENTZ
CHECKED BY D. HITCHCOCK
PROJ. ENGR. S. ROARK
REGIONAL ADM. R. HAIN

REVISION

DATE

BY

REGION NO.
10
STATE
WASH
JOB NUMBER
02C502
CONTRACT NO.

FED.AID PROJ.NO.
NH0512-(012)
LOCATION NO.



EXPIRES 7-20-05
P.E. STAMP BOX

DATE



Washington State
Department of Transportation

P.E. STAMP BOX

DATE

SR 512
VIC. SOUTH HILL TO SR 167 I/C

VICINITY MAP/ADVANCE SIGN

PLOT1

VIC

SHEET
2
OF
35
SHEETS


שטעטל וואס זיך

שטעטל וואס זיך

ITEM NO	TOTAL QUANTITY	SUB-TOTAL * SECTION 1-07.2(1) OF STANDARD SPECS	SUB-TOTAL ** SECTION 1-07.2(2) OF STANDARD SPECS	STD. ITEM NO.	UNIT	ITEM	GROUP 1	GROUP 1	GROUP 1	GROUP 1	GROUP 1	GROUP 2	GROUP 2	GROUP 3							
							EB SR 512 470+65 TO 529+12	WB SR 512 530+48 TO 549+60	SR512 WB 470+65 TO 530+48	SR512 EB 529+12 TO 645+00	SR512 WB 549+60 TO 645+00	NB RAMP 11+00 TO 28+83	SB RAMP SB 644+77 TO SR167 364-	THIRD PARTY DAMAGES							
PREPARATION																					
1	LUMP SUM		LUMP SUM	0001	L.S.	MOBILIZATION	L.S.	L.S.	L.S.	L.S.	L.S.	L.S.	L.S.								
2	36.50		36.50	0170	L.F.	REMOVING GUARDRAIL	14.00	22.50													
3	2.00		2.00	0182	EACH	REMOVING GUARDRAIL ANCHOR	1.00	1.00													
4	LUMP SUM		LUMP SUM	0215	L.S.	REMOVING MISCELLANEOUS TRAFFIC ITEM	L.S.	L.S.				L.S.	L.S.								
GRADING																					
5	1020.00		1020.00	0332	S.Y.	PAVEMENT REPAIR EXCAVATION INCL. HAUL	470.00	260.00				130.00	160.00								
DRAINAGE																					
6	60.00		60.00	1085	TON	QUARRY SPALLS	60.00														
SURFACING																					
7	3.99		3.99		ML	SHOULDER FINISHING	1.82	0.72				0.67	0.78								
LIQUID ASPHALT																					
8	9250.00		9250.00	5334	DOL	ANTI-STRIPPING ADDITIVE	5,158.00	1,752.00				904.00	1,436.00								
ASPHALT CONCRETE PAVEMENT																					
9	4230.00		4230.00	5703	DOL	CRACK SEALING						2,010.00	2,220.00								
10	23632.00		23632.00	5711	S.Y.	PLANING BITUMINOUS PAVEMENT	16,381.00	6,394.00				422.00	435.00								
11	1220.00		1220.00		S.Y.	PLANING BITUMINOUS PAVEMENT 0.5' DEPTH							1,220.00								
12	350.00		350.00	5737	TON	ASPHALT CONC. FOR PAVEMENT REPAIR	160.00	90.00				45.00	55.00								
13	8890.00		8890.00	5751	TON	ASPHALT CONC. PAVEMENT CL. A PG 58-22	4,990.00	1,660.00				850.00	1,390.00								
14	9240.00		9240.00	5830	DOL	JOB MIX COMPLIANCE PRICE ADJUSTMENT	5,150.00	1,750.00				895.00	1,445.00								
15	5812.00		5812.00	5835	DOL	COMPACTION PRICE ADJUSTMENT	3,229.50	1,151.00				487.50	944.00								
EROSION CONTROL AND PLANTING																					
16	10.00		10.00	6403	DAY	ESC LEAD	3.00	2.00	1.00	1.00	1.00	1.00	1.00								
17	11.00		11.00	6463	L.F.	CHECK DAM	11.00														
18	2000.00		2000.00	6489	DOL	TEMPORARY WATER POLLUTION/EROSION CONTROL	1,000.00	500.00				250.00	250.00								
19	15.00		15.00		DAY	SPCC LEAD	5.00	3.00	1.00	1.00	1.00	2.00	2.00								
20	LUMP SUM		LUMP SUM		L.S.	TESC PLAN	L.S.	L.S.				L.S.	L.S.								
21	LUMP SUM		LUMP SUM	7736	L.S.	SPCC PLAN	L.S.	L.S.	L.S.	L.S.	L.S.	L.S.	L.S.								
TRAFFIC																					
22	12.00		12.00	6751	L.F.	BEAM GUARDRAIL TYPE 1	6.00	6.00													
23	87.50		87.50		L.F.	NESTING BEAM GUARDRAIL	25.00	37.50					25.00								
24	2.00		2.00	6774	EACH	BEAM GUARDRAIL ANCHOR TYPE 4	1.00	1.00													
25	5596.00		5596.00	6783	L.F.	RAISING EXISTING BEAM GUARDRAIL	2,579.00	1,647.00					1,370.00								
26	123.00		123.00	6832	EACH	FLEXIBLE GUIDE POST	41.00	24.00				28.00	30.00								
27	3700.00		3700.00	7444	DOL	REPAIR IMPACT ATTENUATOR	3,700.00														
28	2.00		2.00	7447	EACH	TRUCK MOUNTED IMPACT ATTENUATOR	2.00														
29	62.00		62.00	7449	HOUR	OPERATION OF TRUCK MOUNTED IMPACT ATTENUATOR	48.00	14.00													
30	25000.00		25000.00	6806	L.F.	PAINT LINE	12,350.00	4,300.00				3,570.00	4,780.00								
31	1120.00		1120.00	6818	L.F.	PLASTIC WIDE LINE	648.00	472.00													
32	28.00		28.00	6881	EACH	PLASTIC DRAINAGE MARKING	25.00					1.00	2.00								
33	39.00		39.00		EACH	PLASTIC JUNCTION BOX MARKING	17.00	6.00				5.00	11.00								
34	11.88		11.88	6882	HUND	RAISED PAVEMENT MARKER TYPE 1	4.48	1.44				2.67	3.29								
35	6.45		6.45	6884	HUND	RAISED PAVEMENT MARKER TYPE 2	2.67	0.95				0.88	1.95								
36	23355.00		23355.00	6888	L.F.	TEMPORARY PAVEMENT MARKING	13,104.00	4,762.00				1,783.00	3,706.00								
37	LUMP SUM		LUMP SUM	6890	L.S.	PERMANENT SIGNING	L.S.	L.S.	L.S.	L.S.	L.S.										
38	LUMP SUM		LUMP SUM	6899	L.S.	BRIDGE MOUNTED SIGN BRACKET NO.			L.S.	L.S.											
39	310.00		310.00	6956	HOUR	SEQUENTIAL ARROW SIGN	216.00	47.00					47.00								
40	3.00		3.00	6994	EACH	PORTABLE CHANGEABLE MESSAGE SIGN	1.00	1.00				1.00									
41	370.00		370.00	6995	HOUR	OPERATION OF PORTABLE CHANGEABLE MESSAGE SIGN	220.00	75.00				75.00									

GROUP LEGEND :	GROUP NUMBER	SR	CONTROL SECTION	TAX SCHEDULE	FUND PARTICIPANTS
	1	512	273501	**	FEDERAL STATE
	2	167	270705	**	FEDERAL STATE
	3	512	273501	**	STATE

- This item will be deleted after the project was awarded 4/30/02

			REGION	STATE	FEDERAL AID PROJECT. NO.	 Washington State Department of Transportation	SR 512 VIC. SOUTH HILL TO SR 167 I/C	SQ 1 SHEET 3 OF 35 SHEETS
			10	WA	NH-0512(012)			
			JOB NUMBER 02C502/1					
			CONTRACT NO 000000					
DATE	REVISION	BY						SUMMARY OF QUANTITIES


SUMMARY OF QUANTITIES

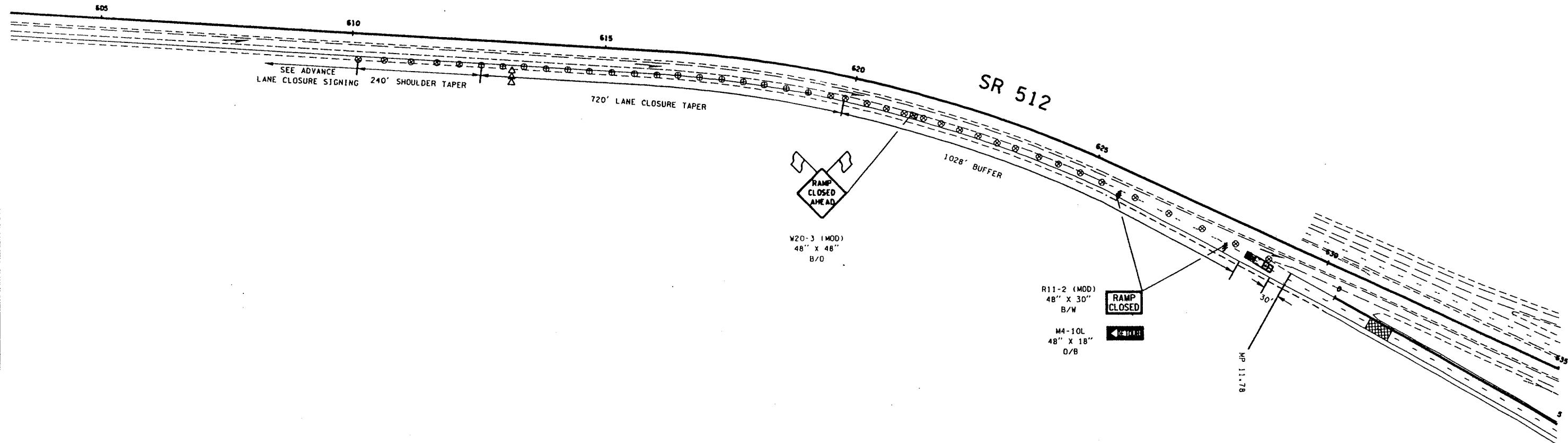
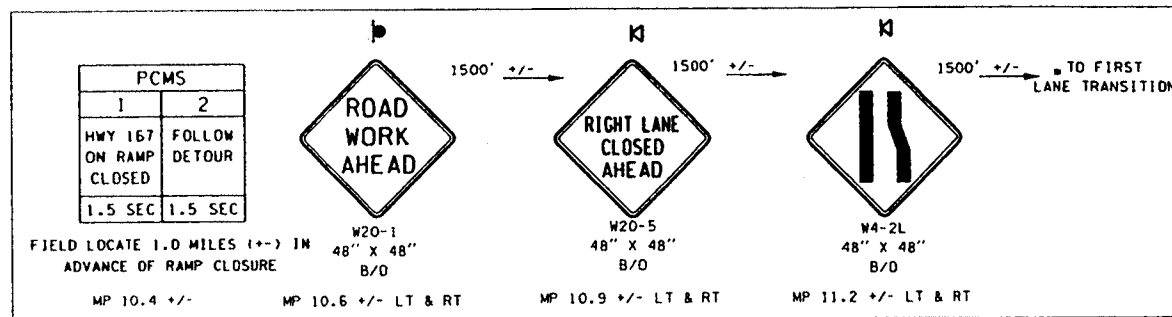
3/27/2002

ITEM NO	TOTAL QUANTITY	SUB-TOTAL * SECTION I-07.2(1) OF STANDARD SPECS	SUB-TOTAL ** SECTION I-07.2(2) OF STANDARD SPECS	STD. ITEM NO.	UNIT	ITEM	GROUP 1 EB SR 512 470+65 TO 529+12	GROUP 1 WB SR 512 530+48 TO 549+60	GROUP 1 SR512 WB 470+65 TO 530+48	GROUP 1 SR512 EB 529+12 TO 645+00	GROUP 1 SR512 WB 549+60 TO 645+00	GROUP 2 NB RAMP 11+00 TO 28+83	GROUP 2 SB RAMP SB 644+77 TO SR167 364-	GROUP 3 THIRD PARTY DAMAGES							
42	LUMP SUM		LUMP SUM	6964	L.S.	TEMPORARY TRAFFIC CONTROL DEVICES	L.S.	L.S.	L.S.	L.S.	L.S.	L.S.	L.S.								
43	500.00		500.00	6979	HOURL	TRAFFIC CONTROL LABOR	204.00	128.00	16.00	16.00	16.00	60.00	60.00								
44	300.00		300.00	6972	HOURL	TRAFFIC CONTROL SUPERVISOR	88.00	72.00	8.00	8.00	8.00	54.00	62.00								
45	428.00		428.00	6982	S.F.	CONSTRUCTION SIGNS CLASS A	272.00		44.00	24.00	24.00		64.00								
						OTHER ITEMS															
46	LUMP SUM		LUMP SUM	7038	L.S.	ROADWAY SURVEYING	L.S.	L.S.	L.S.	L.S.	L.S.	L.S.	L.S.								
47	3.00		3.00	7380	EACH	ADJUST MONUMENT CASE AND COVER						1.00	2.00								
48	8.00		8.00	3100	EACH	ADJUST CATCH BASIN	6.00						2.00								
49	14.00		14.00	7043	EACH	ADJUST JUNCTION BOX	8.00	1.00				3.00	2.00								
50	5000.00		5000.00	7480	DOL	ROADSIDE CLEANUP	1,650.00	850.00				850.00	1,650.00								
51	5.00		5.00	7725	DOL	REIMBURSEMENT FOR THIRD PARTY DAMAGE								5.00							
52	-7.00		-7.00	7728	DOL	MINOR CHANGE	-1.00	-1.00	-1.00	-1.00	-1.00	-1.00	-1.00								

GROUP LEGEND:

GROUP NUMBER	SR	CONTROL SECTION	TAX SCHEDULE	FUND PARTICIPANTS
1	512	273501	**	FEDERAL, STATE
2	167	270705	**	FEDERAL, STATE
3	512	273501	**	STATE

			REGION	STATE	FEDERAL AID PROJECT. NO.	 Washington State Department of Transportation	SR 512 VIC. SOUTH HILL TO SR 167 I/C	SQ2 SHEET 4 OF 35 SHEETS
			10	WA	NH-0512(012)			
			JOB NUMBER 02C502/1					
			CONTRACT NO 000000					
DATE	REVISION		BY				SUMMARY OF QUANTITIES	



LEGEND

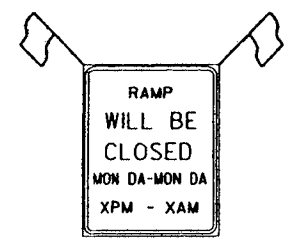
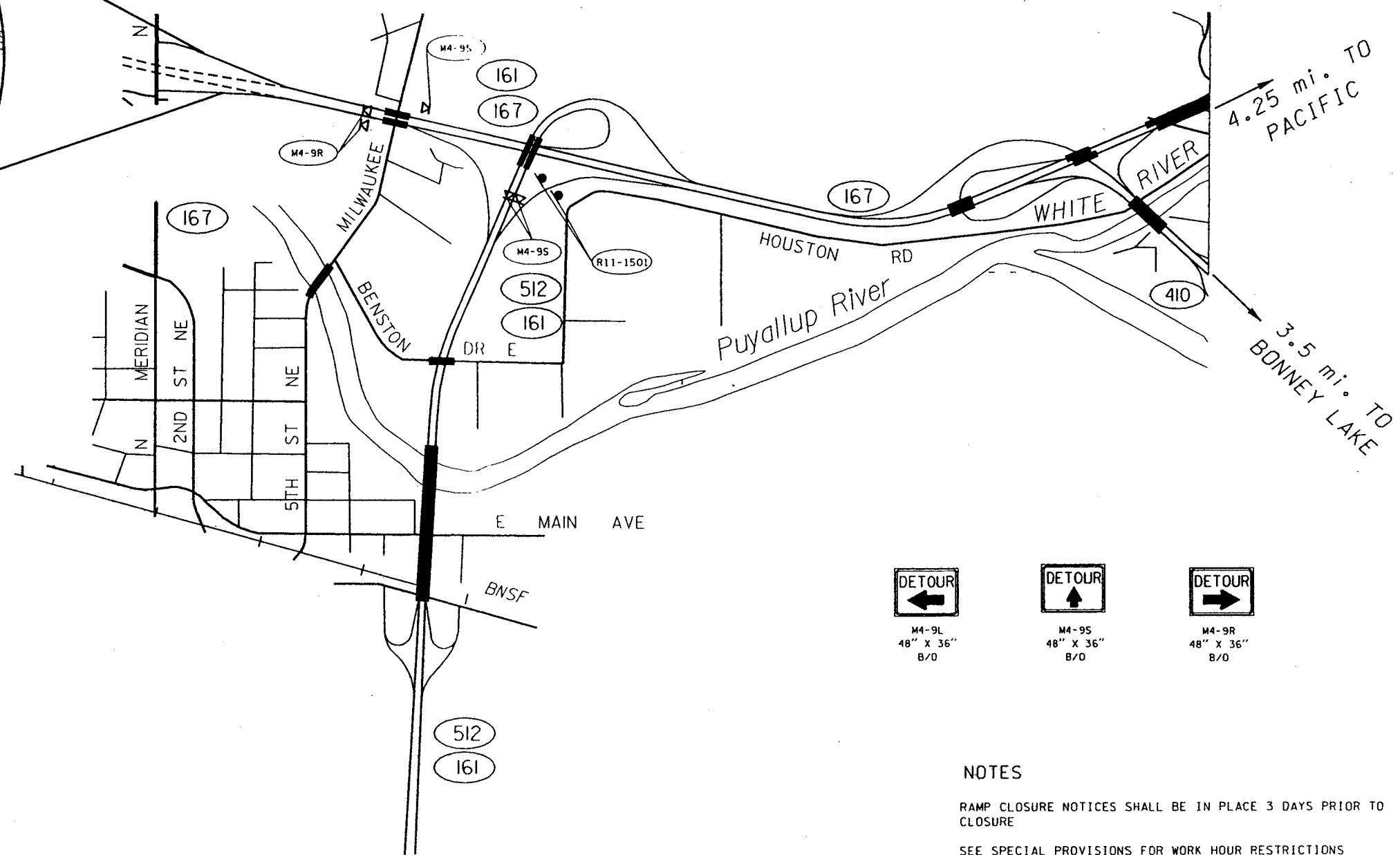
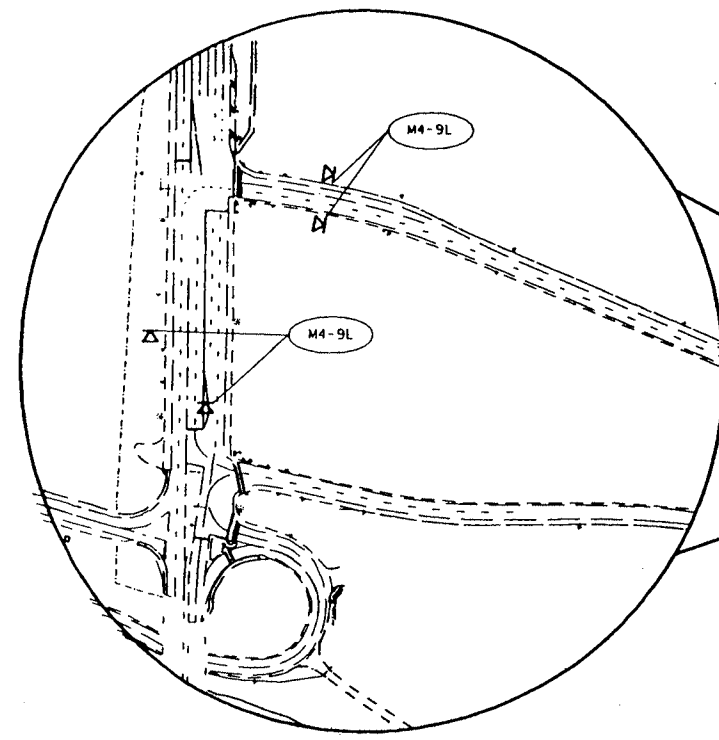
- WARNING FLAG - FLOURESCENT RED/ORANGE
- TYPE III BARRICADE
- SIGN LOCATION - PORTABLE MOUNT
- SIGN LOCATION - TRIPOD MOUNT
- SIGN LOCATION - POST MOUNT
- SEQUENTIAL ARROW TYPE "C"
- TRUCK MOUNTED ATTENUATOR
- TRAFFIC SAFETY DRUM W/ LIGHT
40' O.C. TAPER AND RAMP CLOSURE
80' O.C. TANGENT

NOTES

- RAMP CLOSURE NOTICES SHALL BE IN PLACE 3 DAYS PRIOR TO CLOSURE
- SEE SPECIAL PROVISIONS FOR WORK HOUR RESTRICTIONS
- SEE SHEET TC2 FOR DETOUR ROUTE

EB SR 512 TO NB SR 167 RAMP CLOSURE

FILE NAME	o:\DGN\SR512\15 CADD\pl506tcp.dgn				REGION NO.	STATE	FED.AID PROJ.NO.	Washington State Department of Transportation	SR 512 VIC. SOUTH HILL TO SR 167 I/C	PLOT1
TIME	08:08:25 AM				10	WASH	NH0512-(012)			TC1
DATE	03/18/2002				JOB NUMBER					SHEET
DESIGNED BY	D.WENTZ				02C502					26
ENTERED BY	D.WENTZ				CONTRACT NO.			TRAFFIC CONTROL PLAN		OF
CHECKED BY	C.COMPTON				LOCATION NO.					35
PROJ. ENGR.	J.WYNANDS									SHEETS
REGIONAL ADM.	R.HAIN				REVISION	DATE	BY			
								P.E. STAMP BOX	P.E. STAMP BOX	



R11-1501
48" X 60"
B/W

INSTALL 3 DAYS PRIOR
TO RAMP CLOSURE

LEGEND

- WARNING FLAG - FLOURESCENT RED/ORANGE
- SIGN LOCATION - TRIPOD MOUNT
- SIGN LOCATION - POST MOUNT



M4-9L
48" X 36"
B/O



M4-9S
48" X 36"
B/O



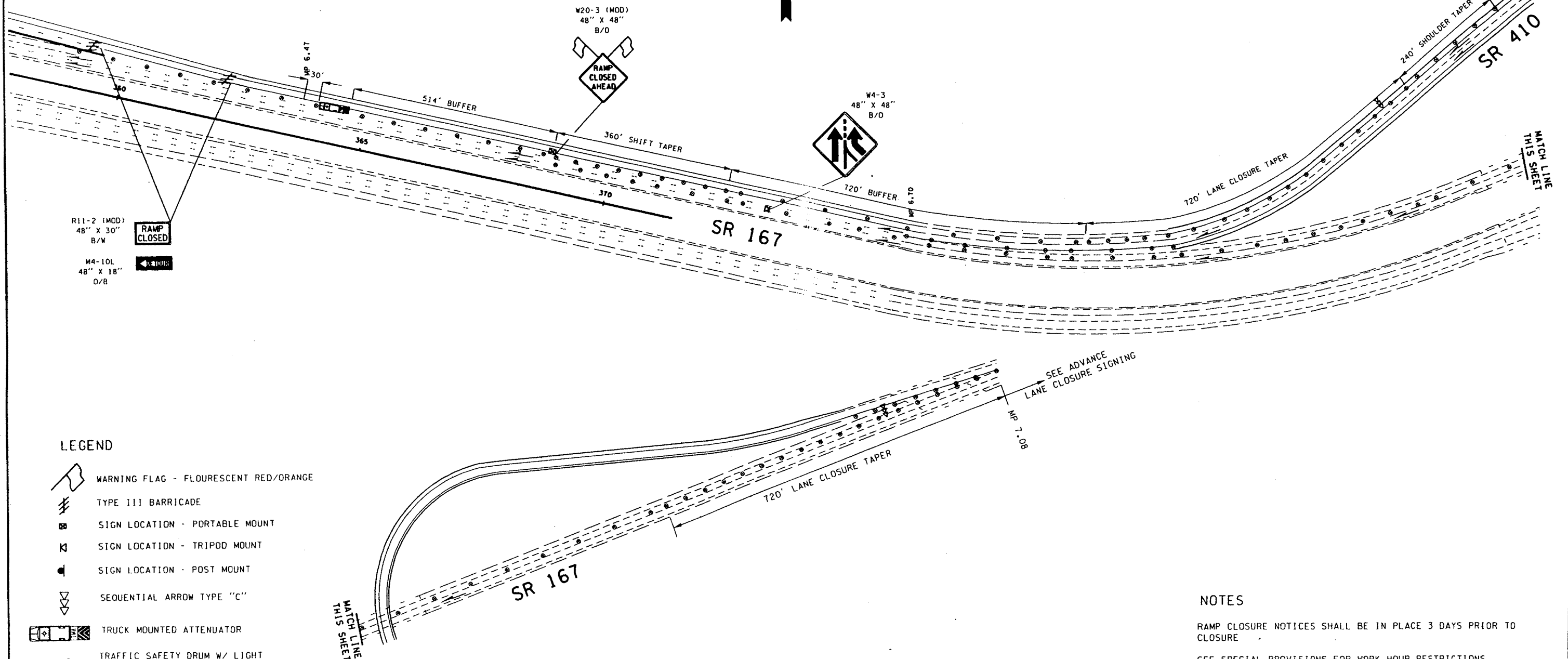
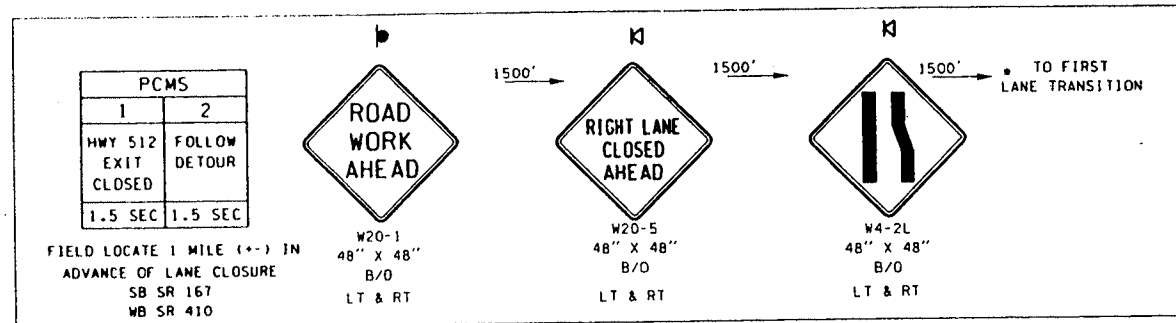
M4-9R
48" X 36"
B/O

NOTES

- RAMP CLOSURE NOTICES SHALL BE IN PLACE 3 DAYS PRIOR TO CLOSURE
- SEE SPECIAL PROVISIONS FOR WORK HOUR RESTRICTIONS
- SEE TC1 FOR LANE AND RAMP CLOSURE DETAILS

RAMP CLOSURE DETOUR EB SR512 TO NB SR167

FILE NAME		o:\DGN\SR512\15 CADD\pl506+cp.dgn										PLOT2	
TIME	08:08:28 AM				REGION NO.	STATE	FED.AID PROJ.NO.					TC2	
DATE	03/18/2002				10	WASH	NH0512-(012)						
DESIGNED BY D.WENTZ					JOB NUMBER		LOCATION NO.					SHEET 27 OF 35 SHEETS	
ENTERED BY D.WENTZ					02C502								
CHECKED BY C.COMPTON					CONTRACT NO.								
PROJ. ENGR. J.WYNANDS							DATE					TRAFFIC CONTROL PLAN	
REGIONAL ADM. R.HAIN							P.E. STAMP BOX						
REVISION				DATE	BY	DATE							
						P.E. STAMP BOX							



LEGEND

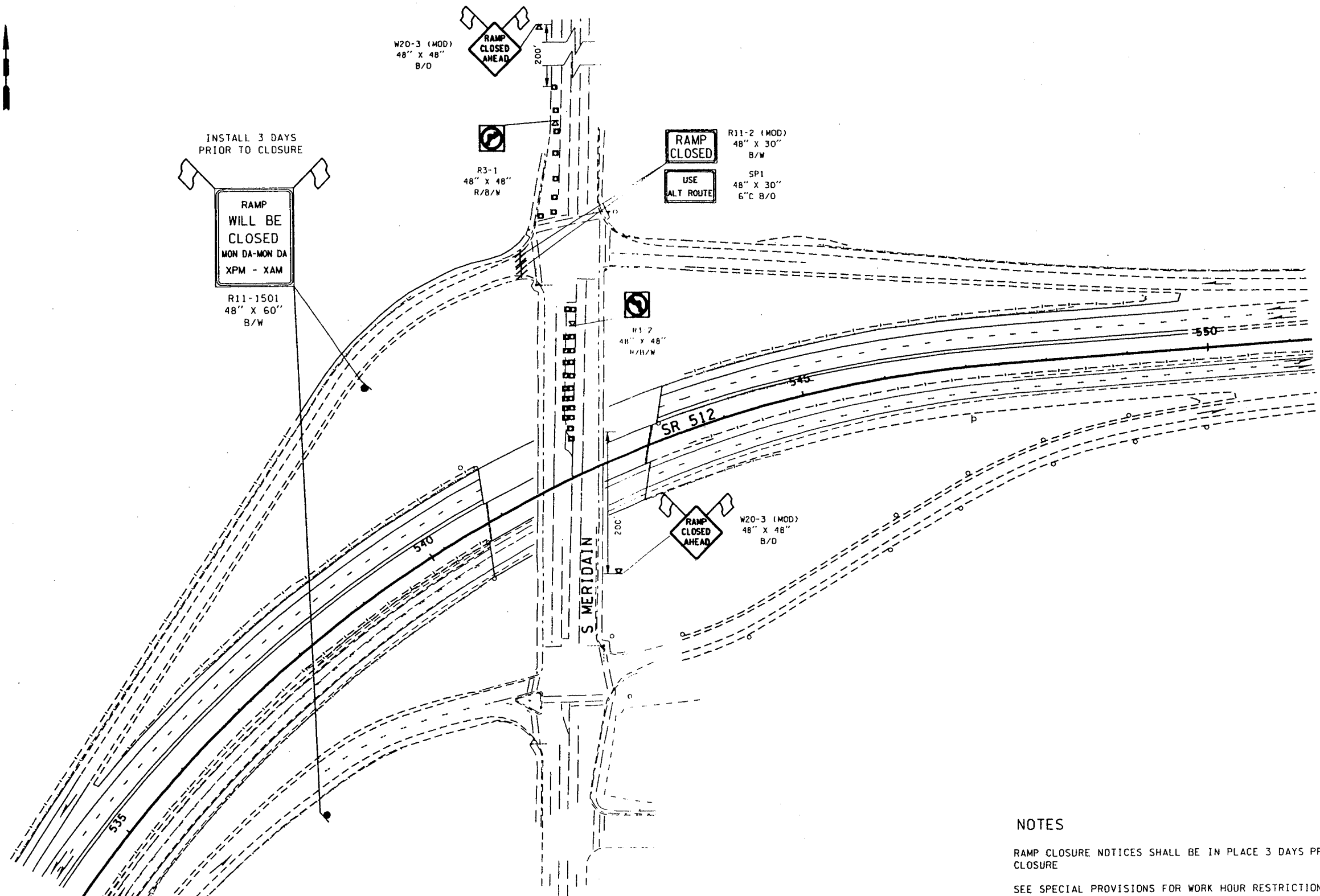
- WARNING FLAG - FLOURESCENT RED/ORANGE
- TYPE III BARRICADE
- SIGN LOCATION - PORTABLE MOUNT
- SIGN LOCATION - TRIPOD MOUNT
- SIGN LOCATION - POST MOUNT
- SEQUENTIAL ARROW TYPE "C"
- TRUCK MOUNTED ATTENUATOR
- TRAFFIC SAFETY DRUM W/ LIGHT
40' D.C. TAPER AND RAMP CLOSURE
80' D.C. TANGENT

NOTES

- RAMP CLOSURE NOTICES SHALL BE IN PLACE 3 DAYS PRIOR TO CLOSURE
- SEE SPECIAL PROVISIONS FOR WORK HOUR RESTRICTIONS
- SEE SHEET TC4 FOR DETOUR ROUTE

NB SR 167 TO WB SR 512 RAMP CLOSURE

FILE NAME	o:\DGN\SR512\5 CADD\p1506tcp.dgn	REGION NO.	10	STATE	WASH	FED.AID PROJ.NO.	NH0512-(012)		SR 512 VIC. SOUTH HILL TO SR 167 I/C	PL0T3
TIME	08:08:31 AM	JOB NUMBER	02C502	CONTRACT NO.		LOCATION NO.				TC3
DESIGNED BY	D.WENTZ									SHEET 28 OF 35 SHEETS
ENTERED BY	D.WENTZ									
CHECKED BY	C.COMPTON									
PROJ. ENGR.	J.WYNANDS									
REGIONAL ADM.	R.HAIN									
REVISION		DATE		BY					TRAFFIC CONTROL PLAN	



LEGEND

- WARNING FLAG - FLOURESCENT RED/ORANGE
- TYPE III BARRICADE
- SIGN LOCATION - TRIPOD MOUNT
- SIGN LOCATION - POST MOUNT
- TEMPORARY TRAFFIC CONTROL DEVICE 20' O.C.

NOTES

RAMP CLOSURE NOTICES SHALL BE IN PLACE 3 DAYS PRIOR TO CLOSURE
SEE SPECIAL PROVISIONS FOR WORK HOUR RESTRICTIONS

SHORT TERM RAMP CLOSURE
WB SR512 ON RAMP

FILE NAME o:\DGN\SR512\15 CADD\pl506+cp.dgn		REGION NO. 10		STATE WASH	FED.AID PROJ.NO. NH0512-(012)	<p>Washington State Department of Transportation</p>	<p>SR 512 VIC. SOUTH HILL TO SR 167 I/C</p>	PLOT5	
TIME 08:08:37 AM		JOB NUMBER 02C502		LOCATION NO.				<p>TRAFFIC CONTROL PLAN</p>	<p>SHEET 30 OF 35 SHEETS</p>
DATE 03/18/2002		CONTRACT NO.							
DESIGNED BY D.WENTZ									
ENTERED BY D.WENTZ									
CHECKED BY C.COMPTON									
PROJ. ENGR. J.WYNANDS									
REGIONAL ADM. R.HAIN									
REVISION		DATE		BY					

PCMS	
1	2
SR 512 ON RAMP CLOSED	USE ALT ROUTE
1.5 SEC	1.5 SEC

FIELD LOCATE
ADVANCE OF LANE CLOSURE

LEGEND

- WARNING FLAG -
FLOURESCENT RED/ORANGE
- TYPE III BARRICADE
- SIGN - TRIPOD MOUNT
- SIGN LOCATION - POST MOUNT
- TEMPORARY TRAFFIC CONTROL DEVICE 20' O.C.
- TRAFFIC SAFETY DRUM 20' O.C.

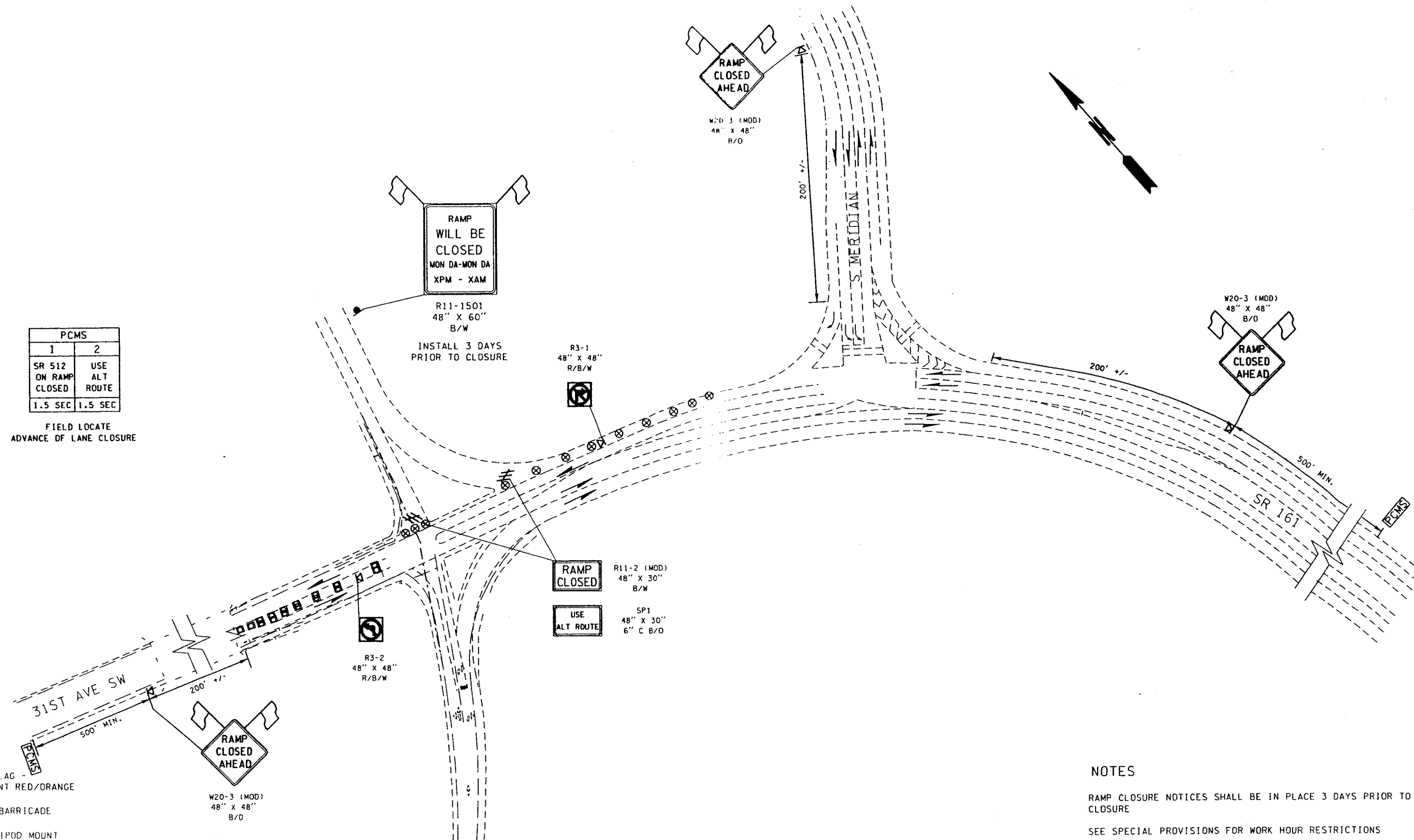
PCMS PORTABLE CHANGEABLE MESSAGE SIGN

FILE NAME o:\DGN\SR512\15 CADD\pi506+cp.dgn		REGION NO. 10		STATE WASH	FED.AID PROJ.NO.	Washington State Department of Transportation	SR 512 VIC. SOUTH HILL TO SR 167 I/C	PLOT6 TC6
TIME 08:08:40 AM		JOB NUMBER 02C502		NH0512-(012)				
DATE 03/18/2002		CONTRACT NO.		LOCATION NO.				
DESIGNED BY D.WENTZ	ENTERED BY D.WENTZ	PROJ. ENGR. J.WYNANDS	REGIONAL ADM. R.HAIN	REVISION	DATE	BY	DATE	DATE

EB SR 512 ON RAMP CLOSURE

NOTES

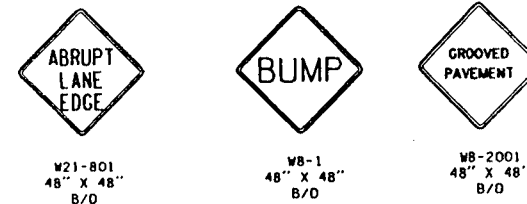
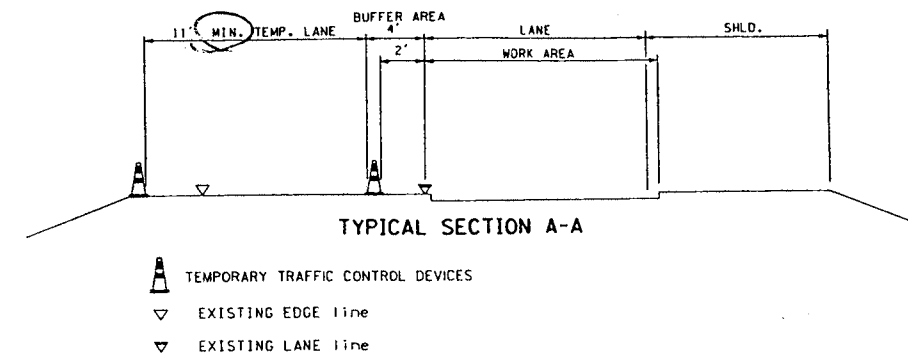
- RAMP CLOSURE NOTICES SHALL BE IN PLACE 3 DAYS PRIOR TO CLOSURE
- SEE SPECIAL PROVISIONS FOR WORK HOUR RESTRICTIONS



BUFFER DATA										
BUFFER SPACE = B										
SPEED (MPH)	25	30	35	40	45	50	55	60	65	70
LENGTH (feet)	55	85	120	170	220	280	335	415	485	585
BUFFER VEHICLE ROLL AHEAD DISTANCE = R										
VEHICLE TYPE	TYPICAL VEHICLE LOADED WEIGHT (lbs)	POSTED SPEED (mph)	STATIONARY OPERATION (feet)	MOVING OPERATION (feet)						
4 YARD DUMP TRUCK	24,000	60-65	30							
		50-55	30							
		45	30							
2 TON CARGO TRUCK	15,000	60-65	30							
		50-55	30							
		45	30							
1 TON CARGO TRUCK	10,000	60-65	50							
		50-55	30							
		45	30							
ROLL AHEAD STOPPING SIGHT DISTANCE ASSUMES DRY PAVEMENT										

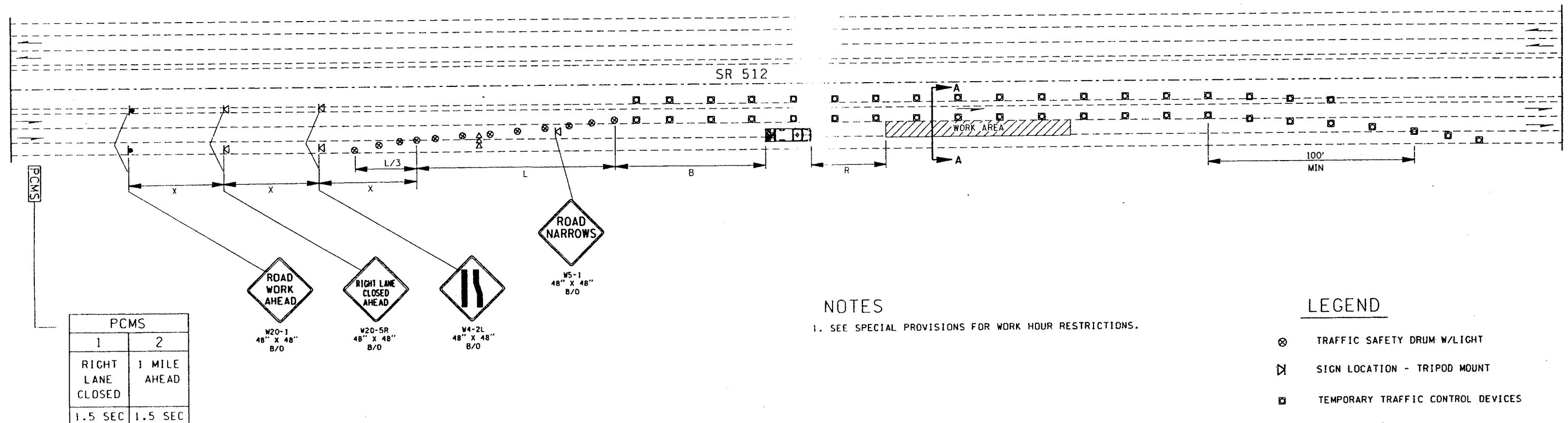
CHANNELIZING DEVICE SPACING (feet)		
MPH	TAPER	TANGENT
50/70	40	80

SIGN SPACING = X (feet)		
Freeways & Expressways	55/70 MPH	1500'± (OR AS PER MUTCD)



FIELD LOCATE AS DETERMINED BY THE ENGINEER TO FIT CONDITIONS

MINIMUM TAPER LENGTH = L (feet)										
LANE WIDTH (feet)	Posted Speed (mph)									
	25	30	35	40	45	50	55	60	65	70
10	-	-	-	-	-	-	550	-	-	-
11	-	-	-	-	-	-	605	660	-	-
12	-	-	-	-	-	-	660	720	780	840




FIELD LOCATE 1 MILE (+/-) IN ADVANCE OF LANE CLOSURE


NOTES

1. SEE SPECIAL PROVISIONS FOR WORK HOUR RESTRICTIONS.

- LEGEND
- ⊗ TRAFFIC SAFETY DRUM W/LIGHT
 - ⊠ SIGN LOCATION - TRIPOD MOUNT
 - ⊞ TEMPORARY TRAFFIC CONTROL DEVICES
 - ⇒ SEQUENTIAL ARROW SIGN - TYPE "C"
 - ⊞ TRUCK MOUNTED ATTENUATOR
 - PCMS PORTABLE CHANGEABLE MESSAGE SIGN

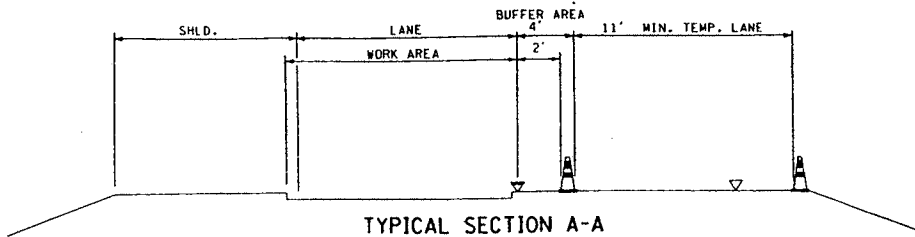
TYPICAL RIGHT LANE WORK AREA PLANING & PAVING OPERATIONS OVERHEAD SIGN REPLACEMENT

FILE NAME	o:\DGN\SR512\15 CADD\p15061cp.dgn										REGION NO.	STATE	FED.AID PROJ.NO.	 Washington State Department of Transportation	SR 512 VIC. SOUTH HILL TO SR 167 I/C	PLOT7		
TIME	08:08:45 AM										10	WASH	NH0512-(012)		TC7	SHEET 32 OF 35 SHEETS		
DATE	03/18/2002										JOB NUMBER							
DESIGNED BY	D.WENTZ										CONTRACT NO.		LOCATION NO.					
ENTERED BY	D.WENTZ																	
CHECKED BY	C.COMPTON																	
PROJ. ENGR.	J.WYNANDS																	
REGIONAL ADM.	R.HAIN																	
REVISION											DATE	BY		P.E. STAMP BOX	DATE	P.E. STAMP BOX	DATE	TRAFFIC CONTROL PLAN

BUFFER DATA											
BUFFER SPACE = B											
SPEED (MPH)	25	30	35	40	45	50	55	60	65	70	
LENGTH (feet)	55	65	120	170	220	280	335	415	485	585	
BUFFER VEHICLE ROLL AHEAD DISTANCE = R											
VEHICLE TYPE	TYPICAL VEHICLE LOADED WEIGHT (lbs)	POSTED SPEED (mph)	STATIONARY OPERATION (feet)	MOVING OPERATION (feet)							
4 YARD DUMP TRUCK	24,000	60-65	30								
		50-55	30								
		45	30								
2 TON CARGO TRUCK	15,000	60-65	30								
		50-55	30								
		45	30								
1 TON CARGO TRUCK	10,000	60-65	50								
		50-55	30								
		45	30								
ROLL AHEAD STOPPING SIGHT DISTANCE ASSUMES DRY PAVEMENT											

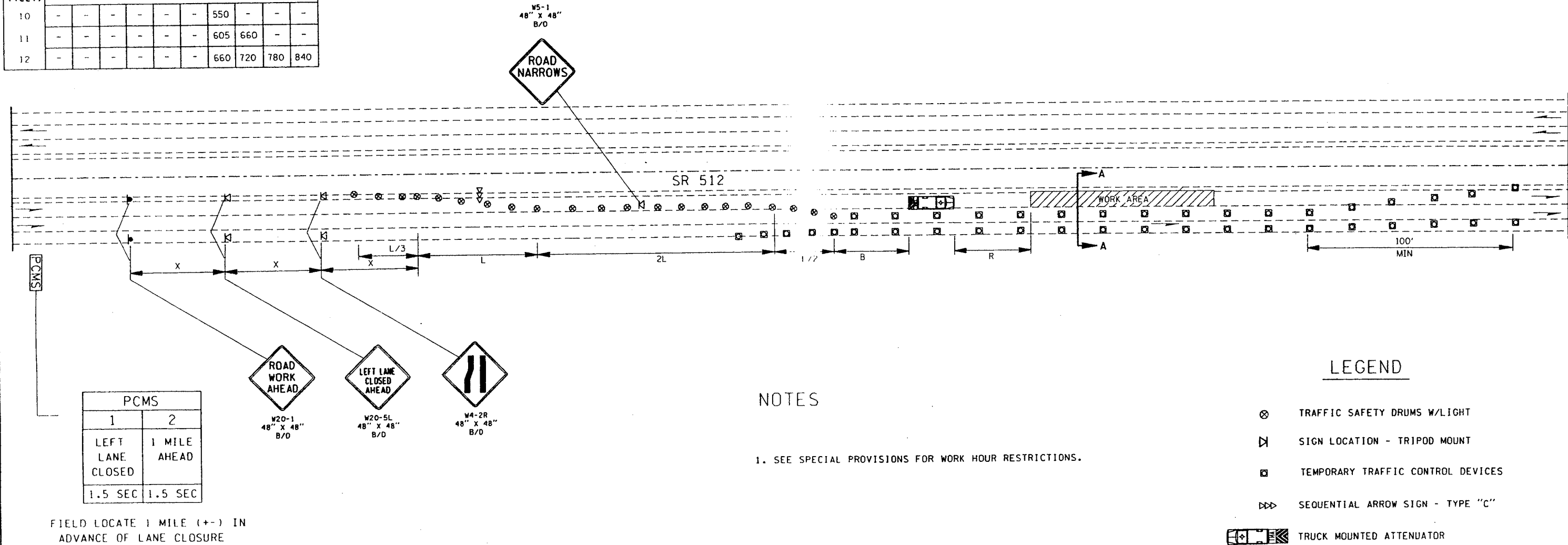
CHANNELIZING DEVICE SPACING (feet)		
MPH	TAPER	TANGENT
50/70	40	80

SIGN SPACING = X (feet)		
Freeways & Expressways	55/70 MPH	1500'± (OR AS PER MUTCD)




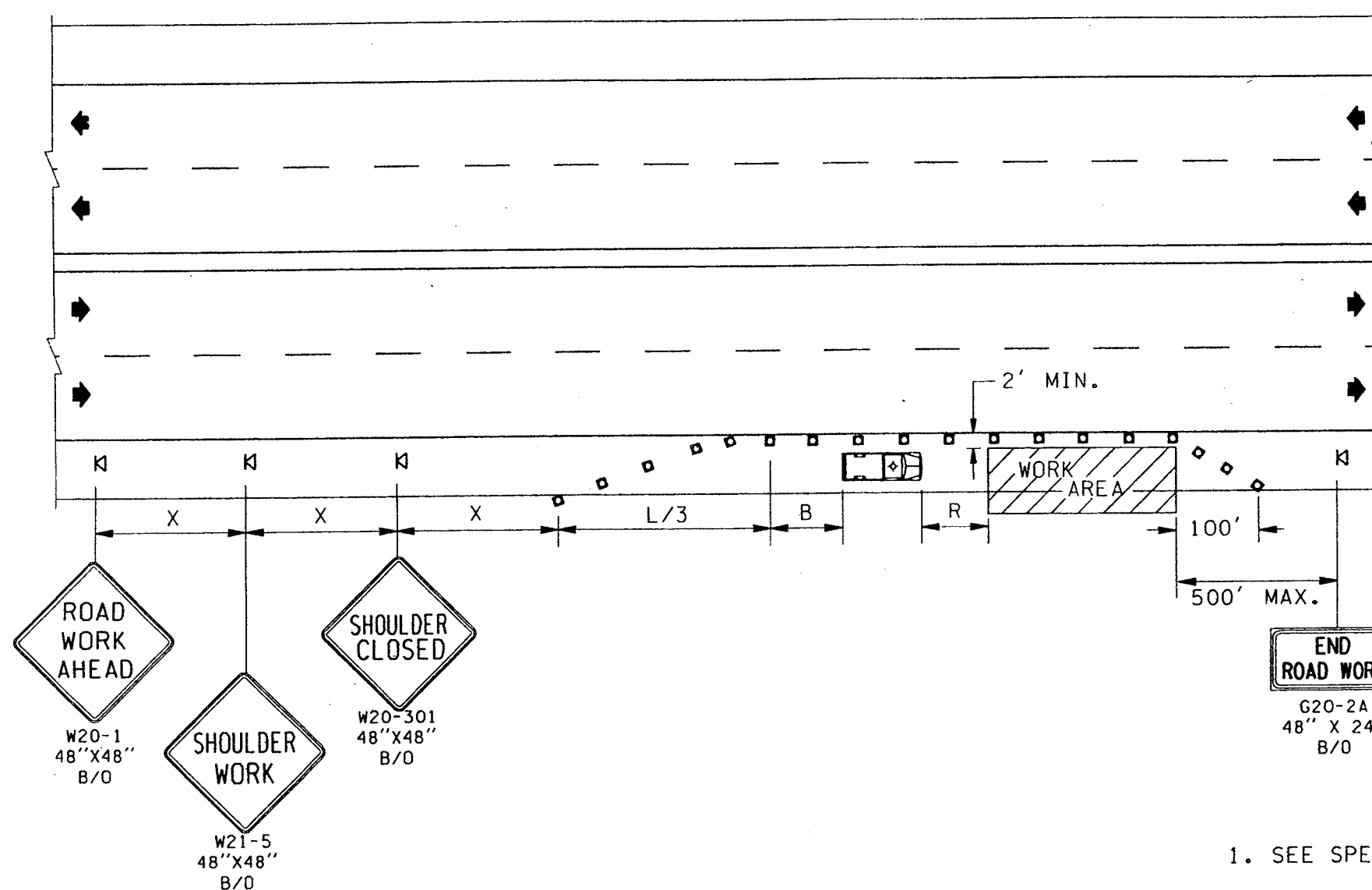
- TEMPORARY TRAFFIC CONTROL DEVICES
- EXISTING EDGE line
- EXISTING LANE line

MINIMUM TAPER LENGTH = L (feet)										
LANE WIDTH (feet)	Posted Speed (mph)									
	25	30	35	40	45	50	55	60	65	70
10	-	-	-	-	-	-	550	-	-	-
11	-	-	-	-	-	-	605	660	-	-
12	-	-	-	-	-	-	660	720	780	840



TYPICAL LEFT LANE WORK AREA PLANING & PAVING OPERATIONS OVERHEAD SIGN REPLACEMENT

FILE NAME			o:\DGN\SR512\15 CADD\p1506+cp.dgn			REGION NO.		STATE		FED.AID PROJ.NO.		 Washington State Department of Transportation		SR 512 VIC. SOUTH HILL TO SR 167 I/C		PL018 TC8	
TIME			08:08:48 AM			10		WASH		NH0512-(012)				SHEET 33 OF 35 SHEETS			
DATE			03/18/2002			JOB NUMBER		02C502		CONTRACT NO.		LOCATION NO.		TRAFFIC CONTROL PLAN			
DESIGNED BY			D.WENTZ			DATE		BY		P.E. STAMP BOX		DATE		P.E. STAMP BOX			
ENTERED BY			D.WENTZ			REVISION											
CHECKED BY			C.COMPTON														
PROJ. ENGR.			J.WYNANDS														
REGIONAL ADM.			R.HAIN														



LEGEND

- K SIGN LOCATION - TRIPOD MOUNT
- □ □ TEMPORARY TRAFFIC CONTROL DEVICES
- PROTECTIVE VEHICLE - RECOMMENDED

SHOULDER CLOSURE - HIGH SPEED (40 MPH OR HIGHER)

BUFFER DATA

BUFFER SPACE = B										
SPEED (MPH)	25	30	35	40	45	50	55	60	65	70
LENGTH (feet)	55	85	120	170	220	280	335	415	485	585
BUFFER VEHICLE ROLL AHEAD DISTANCE = R										
VEHICLE TYPE	TYPICAL VEHICLE LOADED WEIGHT (lbs)	POSTED SPEED (mph)	STATIONARY OPERATION (feet)	MOVING OPERATION (feet)						
4 YARD DUMP TRUCK	24,000	60-65	30							
		50-55	30							
		45	30							
2 TON CARGO TRUCK	15,000	60-65	30							
		50-55	30							
		45	30							
1 TON CARGO TRUCK	10,000	60-65	50							
		50-55	30							
		45	30							
ROLL AHEAD STOPPING SIGHT DISTANCE ASSUMES DRY PAVEMENT										

MINIMUM TAPER LENGTH = L (feet)

LANE WIDTH (feet)	Posted Speed (mph)									
	25	30	35	40	45	50	55	60	65	70
10	-	-	-	270	450	500	550	-	-	-
11	-	-	-	295	495	550	605	660	-	-
12	-	-	-	320	540	600	660	720	780	840

SIGN SPACING = X (feet)

Freeways & Expressways	55/70 MPH	1500'++ (OR AS PER MUTCD)
Rural Roads	45/55 MPH	500'++

CHANNELIZING DEVICE SPACING (feet)

MPH	TAPER	TANGENT
50/70	40	80
35/45	30	60

GENERAL NOTES

- SEE SPECIAL PROVISIONS FOR WORK HOUR RESTRICTIONS.
- NO ENCROACHMENT ON TRAVELED LANE. IF ENCROACHMENT IS NECESSARY, LANE MUST BE CLOSED.
- BUFFER VEHICLE RECOMMENDED - (MAY BE A WORK VEHICLE.)



FILE NAME: o:\DGN\SR512\15 CADD\pl506+cp.dgn		REGION NO. 10		STATE WASH	FED.AID PROJ.NO. NH0512-(012)			SR 512		PLOT9 TC9
TIME: 08:08:52 AM		JOB NUMBER 02C502		VIC. SOUTH HILL TO SR 167 I/C						
DATE: 03/18/2002		CONTRACT NO.		LOCATION NO.		TRAFFIC CONTROL PLAN		SHEET 34 OF 35 SHEETS		
DESIGNED BY: D.WENTZ	ENTERED BY: D.WENTZ	CHECKED BY: C.COMPTON	PROJ. ENGR: J.WYNANDS	REGIONAL ADM. R.HAIN	REVISION	DATE	BY			

CONSTRUCTION SIGN SPECIFICATION SHEET

[illegible]

NOTES: POST LENGTHS SHOWN ARE APPROXIMATE. FINAL VALUES SHALL BE DETERMINED IN THE FIELD PRIOR TO FABRICATION.
FOR STRUCTURE AND MOUNTING DETAILS SEE STANDARD PLAN SHEET SERIES G.
FOR CODE REFERENCES AND STANDARD SIGN LAYOUT DETAILS SEE WASHINGTON STATE "SIGN FABRICATION MANUAL"
SEE SECTION 1-07.23(3) OF THE STANDARD SPECIFICATIONS.

* THE "W" DISTANCE SHALL BE MEASURED FROM THE EDGE OF EXISTING SHOULDER TO THE NEAR SIDE OF THE SIGN EDGE AS STAKED IN THE FIELD BY THE ENGINEER.

					REGION NO.	STATE	FED. AID PROJ. NO.	PROJECT DEVELOPMENT OFFICE	 Washington State Department of Transportation	SR 512 VIC. SOUTH HILL TO SR 167 I/C		TC10		
DESIGNED BY	D WENTZ	1/02			10	WASH	FILL-IN OR BLANK OUT			 Washington State Department of Transportation			SHEET 35 OF 35 SHEETS	
ENTERED BY	D WENTZ	1/02												
CHECKED BY	C COMPTON	1/02												
PROJ. ENGR.	J WYNANDS													
REGIONAL ADM.	R HAIN						CONTRACT NO.			CONSTRUCTION SIGN SPECIFICATION SHEET				
		DATE	DATE	REVISION	BY									

SUPERVISING WORK ZONE TRAFFIC CONTROL

A Two and a Half - Day Training Program Developed by the
Evergreen Safety Council *and*
Washington Department of Transportation
for

TRAFFIC CONTROL SUPERVISOR *Certification*

by
Authorization
of the
Washington State
Traffic Control Oversight Committee



Washington State
Department of Transportation

6/30/2003

WASHINGTON TRAFFIC CONTROL SUPERVISOR

FOREWORD

Concern for the safety of workers, and the motoring and pedestrian public in and around street, highway and freeway construction and maintenance activity, have prompted federal, state and local transportation organizations to seek improvement in construction and maintenance workers' understanding of proper traffic control signage and setup. Toward this end the training and certification of persons to set up and take down traffic control devices is becoming more prevalent among state and local jurisdictions. The foundation of the Washington Department of Transportation's three-day certification course comes primarily from the following sources:

1. Federal Highway Administration, National Highway Institute training materials.
2. Federal Highway Administration's Manual on Uniform Traffic Control Devices (MUTCD), particularly Part VI.
3. State Department of Transportation's policies, standards and guidelines in reference to worker and public safety during highway construction and maintenance operations.

These training materials and the certification training program for Traffic Control Supervisor are for both public and private sector engineers, inspectors, supervisors and field crew personnel.

Candidates for certification receive this manual as a training and reference guide plus other materials including a copy of the MUTCD, Part VI. You are allowed to reference the MUTCD and training materials provided in this notebook when taking the certification examination. By achieving a score of 80% or better on the exam, you will be issued a Washington State Department of Transportation Traffic Control Supervisor certification card, good for four years from the date of your examination.

Traffic Control Supervisor Training and Certification Course

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**Traffic Control Supervisor Training and Certification Course
for
WASHINGTON STATE
2 1/2 Day Agenda**

Day 1:

Course Content Includes the Following Topics:

- **Introduction to Traffic Control**
- **TC Regulations and Resources**
- **Fundamental Principles**
- **TCS / TCM Responsibilities**
- **Traffic Control Devices**
- **Elements of Traffic Control Plans**
 - Exercise: Plan Element Identification
- **Reading Contract Provisions & Plans**

Day 2:

- Workshop: Reading TCP's
- **Traffic Control Labor**
- **Flagging**
 - Exercise: Flagging Operations
- **Installing and Removing TCD's**
 - Exercise: TCD Inventory/Storage

Day 3:

- **TCP Management and Evaluation**
 - Exercise: Preparing Daily TC Diary
 - Exercise: TCP Problem Identification and Correction
 - Workshop: TCP Modification
- **Summary**
- **PASS FAIL TEST**

CHAPTER 1

INTRODUCTION

1.1 SUMMARY

This chapter introduces participants to the National Regulatory Requirements for traffic safety in highway and street work zones, and describe the purpose, scope, objectives, and structure of the “Supervising Work Zone Traffic Control” training course.

1.2 NATIONAL REGULATORY REQUIREMENTS FOR TEMPORARY TRAFFIC CONTROL

The responsibility and complexity of providing safe and efficient temporary traffic control through highway work areas is tremendous. The difficulty of performing these operations correctly has been of concern to highway officials at the federal, state and local levels for the past 20 years many policy statements and research efforts have addressed the subject during this period. An indication of the seriousness of the issue is reflected in a directive which was first issued by the **Federal Highway Administration (FHWA)** in October of 1978, and has since been incorporated into the **Federal Highway Law**, Title 23, United States Code. This directive can be found in the Code of Federal Regulations, Chapter 1, Subchapter G — Engineering and Traffic Operations, Part 630 Pre-construction Procedures, Subpart J, entitled **“Traffic Safety in Highway and Street Work Zones”**. This regulation establishes the requirement that each highway agency develop and implement procedures to assure the safety of motorists, pedestrians, and construction workers on Federal-aid highway construction projects. These procedures must include the following:

- A Traffic Control Plan (TCP) for all projects.
- Assignment of a qualified responsible person in charge of traffic control.
- Pay items for traffic control, if necessary.
- Training of traffic control personnel.
- A process for review and evaluation of the adequacy of traffic control on randomly selected projects.
- Analysis of construction zone accidents to continually correct deficiencies and improve the content of future TCP's.

Many states have adopted the same or similar procedures for all highway work being performed or administered by the state (regardless of funding source), because they have found these procedures to benefit their own operations and to protect them from potential liability suits arising as the result of accidents in temporary traffic control zones.

National standards and guidelines for traffic control devices and their application in temporary traffic control zones are contained in Part VI of the *Manual on Uniform Traffic Control Devices for Streets and Highways* (MUTCD). This manual is issued by the FHWA in accordance with Title 23, U.S. Code, Section 109(d), 114(a), 217, 315 and 402(a), 23 CFR 655.603 and 49 CFR 1.48(b)(8), 1.48(b)(33), and 1.48(c)(2).

1.3 COURSE SCOPE

The course discusses the entire process for interpreting, installing, maintaining, and evaluating proper traffic controls for temporary work zones. While the implementation of temporary traffic control is covered in detail, issues concerning the safety of motorists, pedestrians and highway workers, are also addressed as appropriate. Special emphasis is placed on the duties and responsibilities of the Traffic Control Supervisor and Traffic Control Manager

The principles presented in the course apply to the following:

- All roads open to public travel — including streets, roads, highways, and limited access facilities — regardless of jurisdiction.
- Temporary traffic control zones in urban and rural areas.
- Work activities of various duration and complexity.
- Construction, maintenance, and utility work, and operations associated with emergency and incident management.
- Activities which are performed during daylight hours or at night.

The procedures and devices covered are generally taken from Part VI of the *Manual on Uniform Traffic Control Devices* (MUTCD) and represent national standards and guidelines. Where nationally recognized standards and guidelines are not available, recommendations based on successful procedures developed by the Washington Department of Transportation and several other highway agencies are used, and are presented as acceptable current practice.

1.4 COURSE OBJECTIVES

The course is designed to train personnel in those principles and practices of traffic management which will enable them to provide the safest and most efficient operation of temporary traffic control in work zones. Of critical importance is the need to employ uniform controls recognized by motorists throughout the country, to adhere to national and local standards, and to meet all legal requirements. The course stresses procedures, which have been proven effective, and discourages the use of poor practices often encountered in work zones.

Specific objectives sought in various parts of the course include:

- **Gain an understanding** of each step involved in providing temporary traffic controls.
- Identify and **apply workable concepts and techniques** during the installation, maintenance, and evaluation of controls for construction, maintenance, utility, and incident management situations.
- **Apply traffic control plans which are appropriate** to site conditions, monitor the plans, and make recommended changes indicated by traffic accidents, incidents, and operational difficulties.
- **Discuss techniques and procedures** used by various highway agencies and different groups within an agency.
- **Assess the legal consequences** of actions or inaction relative to temporary traffic control, and identify risk management procedures.

1.5 COURSE STRUCTURE

The course is divided into the following topical areas:

1. **Introduction**
2. **Traffic Control Regulations and Resources**
3. **Fundamental Principles of Traffic Control**
4. **TCS/TCM-Responsibilities**
5. **Traffic Control Devices**

- 6. Elements of Traffic Control Plans**
- 7. Reading Contract Provisions and Traffic Control Plans**
- 8. Traffic Control Labor**
- 9. Flagging**
- 10. Installing and Removing TCD's**
- 11. TCD Management and Evaluation**
- 12. Review**

CHAPTER 2

TRAFFIC CONTROL REGULATIONS AND RESOURCES

2.1 SUMMARY

This chapter covers State and Federal regulatory requirements and Washington State Department of Transportation standards that apply to all aspects of safety in temporary traffic control work zones. Participants will also become familiar with the Definitions, Abbreviations, Web Sites, and Phone Numbers that are commonly used in the traffic control industry in Washington State.

2.2 MANUAL ON UNIFORM TRAFFIC CONTROL DEVICES (MUTCD)

The MUTCD is approved by the Federal Highway Administrator as the National Standard for all highways open to public travel in accordance with Title 23, U.S. Code, Sections 109(d), 114(a), 217, 315 and 402(a), 23 CFR 655.603 and 49 CFR 1.48(b)(8), 1.48(b)(33), and 1.48(c)(2). It is also approved as an American National Standard by the American National Standards Institute. The standards contained in the MUTCD also apply to National Park Service and Forest Service Roads, and all other roads under the jurisdiction of the federal government.

Traffic control devices covered by the standards described in the MUTCD consist of all signs, signals, markings, and devices placed on, over, or adjacent to a street or highway by authority of a public body or official having jurisdiction to regulate, warn, or guide traffic.

States may adopt the MUTCD as their state standard, or they may publish their own manuals and develop supplements to the MUTCD as long as they correlate with and are in substantial conformance with the most recent edition of the national MUTCD. State manuals on traffic control devices must be approved by the Federal Highway Administration.

2.3 PART VI OF THE MUTCD (Temporary Traffic Control)

The MUTCD contains ten parts. Part I contains general provisions, Parts II through IV cover the various types of traffic control devices, and Parts V through X address applications. Of primary interest to this course is Part VI of the manual, but other sections of the manual may have to be consulted whenever situations are encountered which are not fully discussed in Part VI.

2.4 WASHINGTON STATE MODIFICATIONS TO THE MUTCD (WSDOT, M24-01), (WAC 468-95-300 & 310)

Revised Code of Washington (RCW) 47.36, Traffic Control Devices, requires the Washington State Department of Transportation (WSDOT) to adopt uniform standards for traffic control devices installed along state highways. The law also requires that traffic control devices along county roads fully conform to these adopted standards, and those along city streets conform to the extent possible. To fulfill this responsibility, WSDOT, through *Chapter 468-95 of the Washington Administrative Code (WAC)*, has adopted the *Federal Highway Administration's Manual on Uniform Traffic Control Devices (MUTCD)*. Also included in WAC 468-95 are legislative preferences that modify specific parts of the MUTCD and items that address traffic control considerations unique to the Washington State.

(see Tab 15)

2.5 WORK ZONE TRAFFIC CONTROL GUIDELINES (WSDOT, M54-44)

These guidelines were produced by the WSDOT - Work Zone Safety Task Force to assist in minimizing the exposure of WSDOT field personnel and contractors to the hazards associated with work zone traffic control, and to provide motorists and pedestrians with consistent and positive guidance through work zones.

While this booklet provides interpretive guidance, it does not change the intent of Part VI of the Manual on Uniform Traffic Control Devices (MUTCD). The traffic control devices and distances shown in this booklet reflect desired minimums for WSDOT use.

(see Tab 14)

2.6 STANDARD SPECIFICATIONS (DIVISION 1-10, TEMPORARY TRAFFIC CONTROL) WSDOT M41-10

These specifications are produced by the WSDOT. They outline and clarify contractor obligations related to road, bridge and municipal construction. Section 1-10 covers temporary traffic control. This section gives a detailed description of the duties and responsibilities of the Traffic Control Supervisor (TCS), the Traffic Control Manager (TCM), and all other traffic control labor. It also covers the WSDOT scheduled timelines for the implementation of the National Cooperative Highway Research Project, (NCHRP) Report 350, crashworthiness requirements for Traffic Control Devices.

(see Tab 12)

2.8 CONSTRUCTION MANUAL (PARAGRAPH 1-2.3, CONSTRUCTION TRAFFIC CONTROL) WSDOT, M41-01

This manual is provided for WSDOT construction engineering personnel as a convenient guide to the objectives, procedures, and methods for construction administration of Washington State transportation projects. Paragraph 1-2.3 offers specific guidance for construction traffic control. The Construction Manual is intended as a reference book that is consistent with the language and intent of the Standard Specifications.

(see Tab 13)

2.9 QUALITY STANDARDS FOR WORK ZONE TRAFFIC CONTROL DEVICES

These guidelines are produced by the American Traffic Safety Services Association (ATSSA). They have been adopted by reference in the WSDOT – Standard Specifications (Division 1-10), and are to be used on all WSDOT projects. Application of this standard provides the means to meet the requirements of Section 1A.05 (Maintenance of Traffic Control Devices) of the Manual on Uniform Traffic Control Devices (MUTCD) which states:

“Traffic control devices should be maintained to ensure that legibility is retained, that the device is visible, and that it functions properly in relation

to other traffic control devices in the vicinity during both day and night conditions”.

(see ATSSA Booklet)

2.10 WAC 296-155-305, SIGNALING AND FLAGGERS

This Washington Administrative Code (WAC), was adopted by the Washington State Department of Labor and Industries. It covers the requirements for training, certification, clothing and equipment, and work practices for all workers engaged in flagging traffic on or near roadways.

(see Chapter 9, page 9-7)

2.11 DEFINITIONS

Some of the more important terms used in this course are defined here to clarify the meaning intended.

- The following terms are universally used in rules/codes to identify the **level of compliance** required:

shall or must: always means a mandatory requirement

should: used to denote an advisory application

may: indicates a permissive condition

- In the **MUTCD 2000** the following terms are used to identify the **level of compliance** required:

Standard: “shall” conditions

Guidance: “should” conditions

Option: “may” conditions

Support: descriptive and/or general information

- **Clear Zone** - the total roadside border area, starting at the edge of the traveled way that is wide enough to allow an errant driver to stop or regain control of a vehicle. This area might consist of a shoulder, a

recoverable slope, and/or a non-recoverable, traversable slope with clear run-out area at its toe.

- **Delineators** – retroreflective devices mounted on the roadway surface or at the side of the roadway in a series to indicate the alignment of the roadway, especially at night or in adverse weather.
- **Duration of work-** the five categories of work duration and their time at a location shall be:
 - A. **Long-term stationary** is work that occupies a location more than 3 days.
 - B. **Intermediate-term stationary** is work that occupies a location more than one daylight period up to 3 days, or nighttime work lasting more than one hour.
 - C. **Short-term stationary** is daytime work that occupies a location for more than 1 hour, but less than 12 hours.
 - D. **Short duration** is work that occupies a location up to 1 hour.
 - E. **Mobile** is work that moves intermittently or continuously.
- **Freeway** – a divided highway with full control of access.
- **Highway** – a general term for denoting a public way used for purposes of travel by vehicular traffic, including the entire area within the right-of-way.
- **Major Street** – a street normally carrying a higher volume of vehicular traffic.
- **Median** – the area between two roadways of a divided highway measured from the edge of one traveled way to the edge of the other traveled way. The median excludes turn lanes. The median width might be different between intersections, interchanges, and at opposite approaches of the same intersection.

- **Minor Street** – the street normally carrying the lower volume of vehicular traffic.
- **Retroreflectivity** – a property of a surface that allows a large portion of the light coming from a point source to be returned directly back to a point near its origin.
- **Roadway** – that portion of the highway improved, designed, or ordinarily used for vehicular travel and parking lanes, but exclusive of the sidewalk, berm, or shoulder even though such sidewalk, berm, or shoulder is used by persons riding bicycles or other human powered vehicles. In the event a highway includes two or more separate roadways, the term roadway as used herein shall refer to any such roadway separately, but not to all such roadways collectively.
- **Rural Highway** – a Type of roadway normally characterized by lower volumes, higher speeds, fewer turning conflicts, and less conflict with pedestrians.
- **Tangent** - (page 6-14 for definition)
- **Temporary Traffic Control Zone (TTCZ) or Work Zone** - a temporary traffic control or work zone is the area between the first advanced warning sign and the point beyond the work area where traffic is no longer affected.

Most TTCZ's are divided into four areas:

1. **Advanced Work Area**
2. **Transition Area**
3. **Activity Area**
4. **Termination Area**

Work Zones are fully described in **Chapter 6**.

- **Traffic Control Plan (TCP)** - a traffic control plan is a scheme for handling vehicle and pedestrian traffic through a specific highway or street work zone or project. These plans may range in scope from a very detailed TCP designed solely for a specific project, to a reference to a typical application in the MUTCD or a standard drawing approved by a highway agency. The degree of detail in a TCP will depend on the project complexity and the anticipated interference of work activities with traffic movement.

The Elements of Traffic Control Plans are discussed in **Chapter 6**.

- **Typical Application (TA)** - typical applications of temporary traffic control zones have been established to assist in developing TCP's. Selecting the most appropriate typical application requires knowledge and understanding of where the zone is going to be. In addition, typical applications often need to be modified based on site and traffic conditions. Typical applications have been categorized based on the following three factors:
 1. Duration of work
 2. Location of work
 3. Roadway type

Typical Applications are fully discussed in **Chapter 7**.

2.12 ABBREVIATIONS

AASHTO	- American Association of State Highway and Transportation Officials
ADT	- Average Daily Traffic
ATSSA	- American Traffic Safety Services Association
CCIS	- Construction Contracts Information System
CMS	- Changeable Message Sign
DOT	- Department of Transportation
ESC	- Evergreen Safety Council
FHWA	- Federal Highway Administration
HOV	- High Occupancy Vehicle
ITE	- Institute of Transportation Engineers
MUTCD	- Manual on Uniform Traffic Control Devices
NHI	- National Highway Institute
ODOT	- Oregon Department of Transportation
PCB	- Portable Concrete Barrier
PCMS	- Portable Changeable Message Sign
RCW	- Revised Code of Washington

TCM	- Traffic Control Manager
TCOC	- Traffic Control Oversight Committee
TCD	- Traffic Control Device
TCP	- Traffic Control Plan
TCS	- Traffic Control Supervisor
TCT	- Traffic Control Technician
TCV	- Traffic Control Vehicle
TCZ	- Traffic Control Zone
TLTWO	- Two-lane, Two-way Operation
TMA	- Truck Mounted Attenuator
TTCZ	- Temporary Traffic Control Zone
TTV	- Transfer/Transport Vehicle
VMS	- Variable Message Sign
WAC	- Washington Administrative Code
WISHA	- Washington Industrial Safety and Health Act
WSDOT	- Washington State Department of Transportation
WSP	- Washington State Patrol
WZTC	- Work Zone Traffic Control
WZADP	- Work Zone Accident Data Process

2.13 WEB SITES/PHONE NUMBERS

AASHTO (American Association of State Highway & Transportation Officials)

<http://www.aashto.org>

ANSI (American National Standards Institute)

<http://web.ansi.org/>

ATSSA (American Traffic Safety Services Association)

<http://www.atssa.com> or call 540-368-1701

ESC (Evergreen Safety Council)

<http://www.esc.org/> or call 800-521-0778

FHWA (Federal Highway Administration)

<http://www.fhwa.dot.gov/>

ITE (Institute of Transportation Engineers)

<http://www.ite.org>

MUTCD 2000

<http://mutcd.fhwa.dot.gov>

NHTSA (National Highway Traffic Safety Administration)

<http://www.nhtsa.dot.gov/>

WISHA (Labor and Industries)

<http://www.lni.wa.gov/wisha>

WSDOT HOME PAGE

<http://www.wsdot.wa.gov/> (go to Business with WSDOT)

WSDOT ENGINEERING PUBLICATIONS

<http://www.wsdot.gov/fasc/engineering> or call (360)705-7430

WSDOT MOTOR CARRIER SERVICES

(Oversized Load Permits)

<http://www.wsdot.wa.gov/fossc/maint/motor/default.htm>

ANY WASHINGTON STATE LAWS (RCW's OR WAC's)

<http://www.access.wa.gov>

CHAPTER 3

FUNDAMENTAL PRINCIPLES OF TRAFFIC CONTROL

3.1 SUMMARY

This chapter covers the fundamental principles that will guide participants in the completion of their responsibilities as Traffic Control Supervisors.

The purpose of temporary traffic control is to protect motorists, pedestrians, and workers from hazards associated with construction, maintenance and utility operations, and the disruption caused by highway incidents. To accomplish this purpose, temporary traffic control must:

- **Warn** motorists and pedestrians of hazards.
- **Advise** motorists and pedestrians of the proper travel path through the area.
- **Delineate** the path traffic should follow: and
- **Separate and protect** motorists, pedestrians, and workers.

3.2 THE FUNDAMENTALS

Because it is not possible to define every work site and condition, the fundamental principles provide a guiding philosophy for providing good temporary traffic control.

- The control of road users through a temporary traffic control zone is an essential part of every project.
- **Make traffic safety** an integral and **high priority** element of every project.
- **Avoid inhibiting traffic** as much as possible.
- **Guide motorists and pedestrians in a clear and positive manner.**
- **Perform routine inspections** of traffic control elements.

- Throughout the project, **give attention to roadside safety.**
- **Flagging** procedures, when used, **should provide positive guidance** to road users.

The goal of traffic control is to:

- **Make the work site safe**
- **Keep traffic moving safely**
- **Minimize liability**
- **Meet Federal and State regulations**

The key elements of traffic control are:

- **Give adequate warning and guidance**
- **Keep the controls simple**
- **Follow recognized standards**

3.3 HUMAN FACTORS

Expectancy

Based on their experience with similar situations in the past, people expect certain things to appear and to operate in a certain way. A common example is the location of the on-off light switch near the entrance to a dark room. Over a period of time, these expectancies develop into a workable set of expectations, which allow people to anticipate and plan a course of action.

Expectancies affect the perception of, and reaction to information so that:

- **When expectancies are met and reinforced, performance tends to be error free.**
- **When expectancies are violated, motorists need more time to respond, their performance may be poorer, and they may commit errors or even fail to respond.**

Once a driver has perceived a hazard, he/she must decide on a course of action and respond accordingly. **Motorists need more time to decide on the appropriate action when:**

- **The situation is unfamiliar.**
- **Several responses are possible.**
- **The maneuver required is complex, or**
- **The driver is impaired** in some manner, such as fatigue, drowsy, on medication, or under the influence of alcohol or illegal drugs.

Common examples of temporary traffic control zone situations which violate driver expectancy include road and lane closures, median crossovers, detour pavement markings, reduced speed limits, slow moving traffic, and workers and equipment in or near the travel lanes.

Key characteristics of effective traffic controls are:

- **In “similar situations”,**
- **use “similar treatments”,**
- **to get a “similar response”.**

When a situation is very complex, the driver may not be able to determine alternatives, and may feel that each choice is equally attractive. In these complex situations the driver may temporarily freeze and be unable to make any speed or path choice at all. Studies of drivers approaching arrow displays operating in the double arrow mode have shown that many motorists change lanes at the last moment because of the difficulty in selecting between the two alternatives presented to them by the double arrow.

Positive Guidance

Fundamental to positive guidance is providing information to the driver at a point where he/she has sufficient time to react.

For temporary work zones to operate safely, the traffic control plan must be designed to provide adequate decision sight distance for drivers traveling through the control zone.

DECISION SIGHT DISTANCE: *“The distance at which a driver can detect a hazard in an environment of visual noise and clutter, recognize it (or its threat potential), select appropriate speed and path, and perform the required action safely and efficiently.”*

All persons responsible for traffic control must minimize the difficulty of driving through a temporary traffic control zone by:

- **Reducing the number of features** which can cause driver error.
- **Ensuring that motorists are adequately warned** of features that cannot be eliminated.
- **Protecting drivers from hazards.**

Credibility

Credibility means **the message conveyed by the traffic control device must be accurate and relevant to the situation.**

To increase the credibility of information, adhere to the following:

- **Turn, cover or remove signs that are not applicable.**
- **Don't post unnecessarily restrictive speed limits.**
- **Don't inform the motorist to expect a hazard that is not there.**
- **Avoid unexpected situations** because surprised drivers may react in unexpected ways.
- **Maintain controls** as if every driver were approaching the temporary traffic control zone for the first time.

3.4 PEDESTRIAN SAFETY

Principles, which specifically apply to the operation of pedestrian facilities in work zones, include the following:

- **Pedestrians should be provided with access and safe passage** through the temporary traffic control zone at all times.
- **Drivers and pedestrians should be guided in a clear and positive manner** while approaching and traversing the temporary traffic control zone.
- **Pedestrian paths through the temporary traffic control zone should be protected** to minimize pedestrian exposure to errant vehicles.
- **Pedestrians should not be led into direct conflicts with work site vehicles, equipment or operations.**
- **Pedestrians should not be led into direct conflicts with mainline traffic** moving through or around the work site.
- **Pedestrians should be provided with a safe, convenient travel path** that replicates as nearly as possible the most desirable characteristics of sidewalks or footpaths.

In accommodating the needs of pedestrians at work sites, it should always be remembered that the range of pedestrians that can be expected is very wide, including the blind, the hearing impaired, and those with mobility handicaps. All pedestrians need protection from potential injury and a smooth, clearly defined travel path.

Whenever possible, signing should be used to direct pedestrians to a safe street crossing in advance of an encounter with a temporary traffic control zone. Signs should be placed at intersections so that pedestrians, particularly in high-traffic volume urban and suburban areas, are not confronted with mid-block work sites that will encourage them to skirt the temporary traffic control zone or make a mid-block crossing. It must be recognized that pedestrians will only infrequently retrace their steps to make a safe crossing. It's for this reason that sufficient advance notification of sidewalk closures is critically important.

3.5 WORK ZONE ACCIDENTS

Since one of the objectives of work zone traffic control is to safely guide traffic through the zone, study of work zone accidents is valuable to identify opportunities to increase the level of safety in work zones for pedestrians, motorists and workers.

(see tab 17 for current Work Zone Accident Data)

Causes

When the pavement or adjacent area is occupied for a work activity, conflict arises between the requirements of the work force and the needs and desires of the traveling public. **Worksites create potential hazards because they:**

- **Confront motorists with unexpected** and sometimes confusing situations;
- **Create obstructions** with which the motorist can collide;
- **Divert motorists' attention** from the driving task; and
- **Expose workers** to traffic.

3.6 FEEDBACK FROM ROAD USERS

It is important to recognize and act upon feedback from the motorists and circumstances occurring in the roadway itself. This lets us know that the highway user is uncomfortable with the setup of the temporary traffic control zone and conditions that exist could lead to accidents. This feedback comes in many forms with the most common being:

- **Brake applications** indicating traffic conflicts.
- **Tire marks** on the pavement and on temporary barriers.
- **Frequently displaced channelizing devices.**
- **Letters or phone calls** to the highway agency from motorists and other users.

- **Horn blowing**, often accompanied by **gestures**.
- **Verbal abuse** of workers by upset motorists.

3.7 DEALING WITH THE ANGRY MOTORIST

It seems that motorists of all ages and types will at times become angry enough to lose control and display open hostility toward the road workers who have interrupted their normal routine. The motorist is generally not angry with the workers but with the interruption and inconvenience. The driver may be late for an appointment or just had a conflict with another person and does not want the hassle or delay.

In today's environment one does not want to add fuel to the motorists' agitation. Workers must be in control of the situation at all times and not enter into the conflict with the angry motorist. As a representative of the crew and company, the worker must exercise restraint and work to defuse the situation. The following are some tips to help reduce the motorists' anxiety and win their support:

- **Make sure traffic control workers are aware of all expected delays**, when they will occur, and how long they will last. You can pass this information on to the driver and possibly prevent them from becoming more angry.
- **Smile and be as pleasant as possible** toward the angry motorist. It is harder for the motorist to be upset with a worker who is polite and appears to be glad to see them.
- **Apologize to the motorist for the inconvenience.** It can have a calming effect on the angry motorist if someone cares about the reason for their frustration.
- Regardless of how irrational the irate motorist's statements are, **agree with them** or at least **do not challenge** them. If you agree or do not create opposition they have no one to argue with and you do not become a target.
- **Avoid extended eye contact** with a hostile motorist, but do keep them under surveillance and watch for any sudden hostile movement.

CHAPTER 4

TRAFFIC CONTROL SUPERVISOR AND TRAFFIC CONTROL MANAGER RESPONSIBILITIES

4.1 SUMMARY

This chapter will familiarize the participants with the duties and responsibilities of each member of the traffic control management team.

4.2 TRAFFIC CONTROL MANAGEMENT

WSDOT, Construction Manual M41-01

“The Contractor has the responsibility for managing traffic control and providing safe traffic control measures that are appropriate for the type of work and consistent with the requirements of the contract plans and specifications. The Contractor’s traffic control work is a contract item. Just like all other contract items, it must be inspected for adequacy and conformance with the contract.”

“The TCM and TCS work together with the Project Engineer and WSDOT’s designated TCS to address traffic control issues as the work progresses. Planning and coordination of the Contractor’s work efforts with appropriate traffic control measures are the primary responsibility of the TCM. It is also the responsibility of the TCM to ensure that any Contractor proposed Traffic Control Plans (TCPs) needed to complement the Contractor’s work operations are approved in advance and the necessary resources to implement the TCP are available. The TCS ensures that the traffic control measures shown on the approved TCPs are properly implemented, operating, and documented on the project. The Contractor’s TCS may not be required full time on the project, but is required to perform all duties required by the specifications. When the Contractor is working multiple shifts, it may be necessary to have more than one person assigned as a TCS.”

“WSDOT will also provide a Traffic Control Supervisor. It is intended to have qualified, trained representatives from both the Contractor and WSDOT work together to achieve safe traffic control operations on the project.”

4.3 TEMPORARY TRAFFIC CONTROL

WSDOT, Standard Specifications, M41-10

1-10.2(1) General

“It is the Contractors responsibility to plan, conduct and safely perform the work. The Contractor shall designate an individual or individuals to perform the duties of Traffic Control Manager (TCM). The TCM must be an employee of the Contractor. The duties of the TCM may not be subcontracted.”

“The Contractor shall also designate an individual or individuals to perform the duties of the Traffic Control Supervisor (TCS). The TCS shall be responsible for safe implementation of Traffic Control Plans provided by the TCM.”

“The TCM and TCS shall be certified as worksite traffic control supervisors by one of the organizations listed in the Special Provisions. A TCM and TCS are required on all projects that have traffic control. The TCM may also perform the duties of the TCS. The Contractor shall identify an alternate TCM and TCS who can assume the duties of the assigned or primary TCM and TCS in the event of that person’s inability to perform. Such alternates shall meet the same requirements as the primary TCM and TCS.”

“The Contractor shall maintain 24-hour telephone numbers at which the TCM and TCS can be contacted and be available upon the Engineer’s request at other than normal working hours. The TCM and TCS shall have the appropriate personnel, equipment, and material available at all times in order to expeditiously correct any deficiency in the traffic control system.”

1-10.2(1)A Traffic Control Manager

“The duties of the Traffic Control Manager (TCM) shall include:

1. Overseeing and approving the actions of the Traffic Control Supervisor (TCS) to ensure that proper safety and traffic control measures are implemented and consistent with the specific requirements created by the Contractor’s work zones and the Contract.
2. Providing the Contractor’s designated TCS with approved Traffic Control Plans (TCP’s) which are compatible with the work operations and traffic control for which they will be implemented.

3. Discussing proposed traffic control measures and coordinating implementation of the Contractor-adopted traffic control plan(s) with the Engineer.
4. Coordinating all traffic control operations, including those of subcontractors, suppliers, and any adjacent construction or maintenance operations.
5. Coordinating the project's activities (such as ramp closures, road closures, and lane closures) with appropriate police, fire control agencies, city or county engineering, medical emergency agencies, school districts, and transit companies.
6. Oversee all requirements of the contract which contribute to the convenience, safety, and orderly movement of vehicular and pedestrian traffic.
7. Having the latest adopted edition of the MUTCD including the Modifications to the MUTCD for Streets and Highways for the State of Washington and applicable standards and specifications available at all times on the project.
8. Attending all project meetings where traffic management is discussed.
9. Reviewing the TCS diaries daily and being aware of "field" traffic control operations.
10. Assuring daily submissions of previous day's TCS diaries, including date of TCM review, to WSDOT TCS.
11. Being present on-site a sufficient amount of time to adequately accomplish the above-listed duties."

1-10.2(1)B Traffic Control Supervisor

"A Traffic Control Supervisor (TCS) shall be on the project whenever traffic control labor is required or less frequently, as approved by the Engineer."

"The TCS shall personally perform all the duties of the TCS. During non-work periods, the TCS shall be available to the job site within a 45-minute time period after notification by the Engineer."

"The TCS's duties shall include:

1. Inspecting traffic control devices and nighttime lighting for proper location, installation, message, cleanliness, and effect on the traveling public. Traffic control devices shall be inspected each work shift except the Class A signs and nighttime lighting need to be checked only once a week. Traffic control devices left in place for 24 hours or more should be inspected once during the nonworking hours when they are initially set up (during daylight or darkness, whichever is opposite the working hours).
2. Preparing a daily traffic control diary on DOT Forms 421-040A and 421-040B, which shall be submitted to the Engineer no later than the end of the next working day to become a part of the project records. The Contractor may use their own form if it is approved by the Engineer. Include in the diary such items as:
 - a. When signs and traffic control devices are installed and removed.
 - b. Location and condition of signs and traffic control devices.
 - c. Revisions to the approved traffic control plan (TCP).
 - d. Lighting utilized at night, and
 - e. Observations of traffic conditions.
3. Ensuring that corrections are made if traffic control devices are not functioning as required. The TCS may make minor revisions to the approved traffic control plan to accommodate site conditions as long as the original intent of the traffic control plan is maintained and the revision has concurrence of the TCM and/or WSDOT TCS.
4. Attending traffic control coordinating meetings or coordination activities as authorized by the Engineer.
5. Ensuring that all needed traffic control devices are available and in good working condition prior to the need to install those devices.
6. Having a current set of approved TCP's and applicable contract provisions as provided by the TCM and the latest adopted edition of the MUTCD including the Modifications to the MUTCD for Streets and Highways for the State of Washington and applicable standards and specifications.

The TCS may perform the work described by "Traffic Control Labor" as long as the duties of the TCS are accomplished.

Possession of a current flagging card by the TCS is mandatory.

A reflective (retroreflective) vest and a hard hat shall be worn by the TCS."

CHAPTER 5

TRAFFIC CONTROL DEVICES

5.1 SUMMARY

This chapter covers the selection and proper use of all temporary traffic control devices.

The purpose of traffic control devices, as well as the principles for their use, is to promote and enhance highway safety and efficiency by providing for the orderly movement of all road users on all streets and highways.

Traffic control devices are often the only means to communicate with the road user.

Traffic control devices include signs, signals, lighting units, pavement markings, delineators, channelizing units, portable barriers, impact attenuators, rumble strips, and screens. This Chapter discusses the specifications for the size, color, and application of each device.

5.2 PRINCIPLES OF TRAFFIC CONTROL DEVICES

To be effective, all traffic control devices including flaggers, should meet the following five basic requirements:

- **Fulfill a need.**
- **Command attention**
- **Convey a clear simple meaning**
- **Command respect of road users**
- **Give adequate time for proper response**

5.3 CONFORMANCE TO ESTABLISHED STANDARDS

WSDOT, Standard Specifications M41-10

“Flagging, signs, and all other traffic control devices furnished or provided shall conform to the standards established in the latest adopted edition of the *“Manual on Uniform Traffic Control Devices”* (MUTCD) published by the U.S. Department of Transportation and the Modifications to the MUTCD for Streets and Highways for the State of Washington. Copies of the MUTCD may be purchased from the Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. 20402. Modifications to the MUTCD for Streets and Highways for the State of Washington may be obtained from the Department of Transportation, Olympia, Washington 98504.”

“In addition to the standards of the MUTCD described above, the Contracting Agency has scheduled the implementation of crashworthiness requirements for all workzone devices. **The National Cooperative Highway Research Project (NCHRP) Report 350 has established requirements for crash testing. Workzone devices are divided into four categories. Each of those categories and the schedule for implementation is described:**

Category 1 includes those items that are small and lightweight, channelizing, and delineating devices that have been in common use for many years and are known to be crashworthy by crash testing of similar devices or years of demonstrable safe performance. These include **cones, tubular markers, flexible delineator posts, and plastic drums with no attachments**. All Category 1 devices used by the project shall meet the requirements of NCHRP 350 as certified by the manufacturer of the device. The Contractor shall obtain the manufacturer’s certification documentation for all such devices purchased and shall keep the documentation available for inspection throughout the life of the project.

Category 2 includes devices that are not expected to produce significant vehicular velocity change, but may otherwise be hazardous. Examples of this class are **barricades, portable sign supports and signs, intrusion alarms and vertical panels**. Any new Category 2 device purchased after October 1, 2000 shall meet the requirements of NCHRP 350.

Existing equipment, purchased prior to October 1, 2000, may be used on the project until December 31, 2007. For the purpose of definition, a sign support and sign shall be considered a single unit. A new sign may be purchased for an existing sign support and the entire unit will be defined as “existing equipment.” The contract documents will contain provisions that list all Category 2 devices deemed compliant with NCHRP 350 and acceptable for use on the project. The Contractor may select from that list when obtaining new equipment or may submit other products for the Engineer’s consideration.

Category 3 is for hardware expected to cause significant velocity changes or other potentially harmful reactions to impacting vehicles. **Barriers, fixed sign supports, crash cushions, truck mounted attenuators (TMA's)** and other work zone devices not meeting the definitions of Category 1 or 2 are examples from this category. Many Category 3 devices are defined in the design of the project. Where this is the case, NCHRP 350 requirements have been incorporated into the design and the Contractor complies with the requirements by constructing according to the plans and specifications. Where the device is a product chosen by the Contractor, the device chosen must be compliant with the requirements of NCHRP 350.

Category 4 includes portable or trailer-mounted devices such as **Arrow Displays, Temporary Traffic Signals, Area Lighting Supports, and Portable Changeable Message Signs.**

Condition of Traffic Control Devices

WSDOT, Standard Specifications (M41-10)

"The condition of signs and traffic control devices shall be new or 'acceptable' as defined in the book *Quality Standards for Work Zone Traffic Control Devices*, and will be accepted based on a visual inspection by the Engineer. The Engineer's decision on the condition of a sign or traffic control device shall be final. When a sign or traffic control device becomes classified as 'not acceptable' it shall be removed from the project and replaced within 12 hours."

5.4 SIGNS

Signs advise, warn, and instruct the motorist on how to drive through the worksite.

Choosing Signs

Standard signs and messages, **as shown in the MUTCD and M54-44**, shall be used.

The use of "AHEAD" instead of "FEET" on advance warning signs is preferred by WSDOT.

MUTCD 2000

"Because of their importance, Advanced Warning Signs for high-speed locations shall have a size of 48" x 48"...."

"All signs used at night shall be either retroreflective with a material that has a smooth, sealed outer surface or illuminated to show the same shape and similar color both day and night."

The overall effect of the signs is to **make the driver aware** of what he or she is approaching and what action is required.

Positioning of Signs

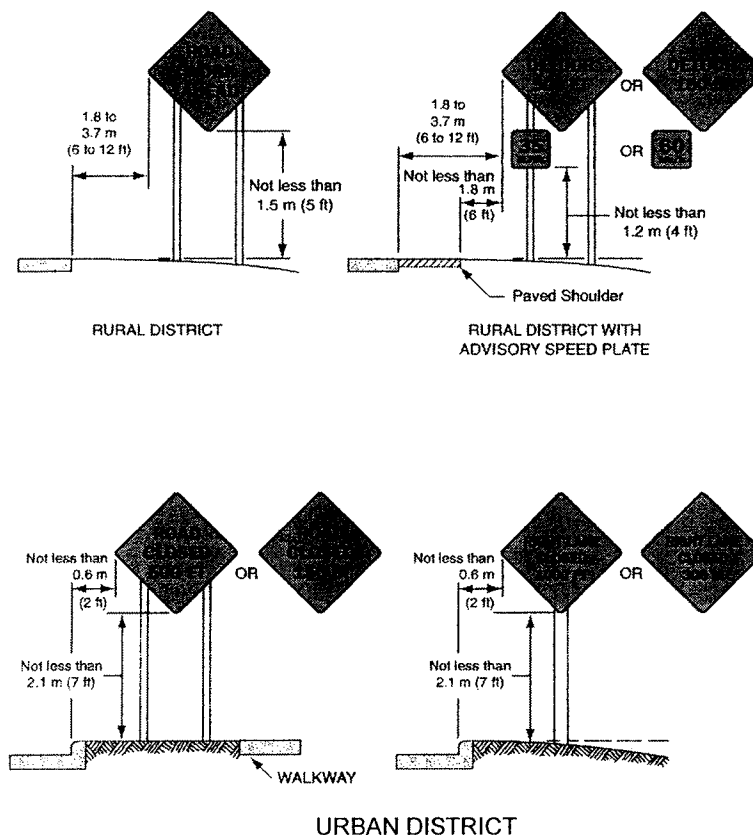
Signs should be positioned using the following principles:

- **Locate signs where they are easily seen.**
- **Place signs so drivers have time to respond.**
- **As a general rule, place signs on the right-hand side of the roadway.**
- **Where special emphasis is needed, signs may be placed on both the left and right sides on the shoulder; on portable supports within the roadway; or on or above barricades.**

Mounting of Signs

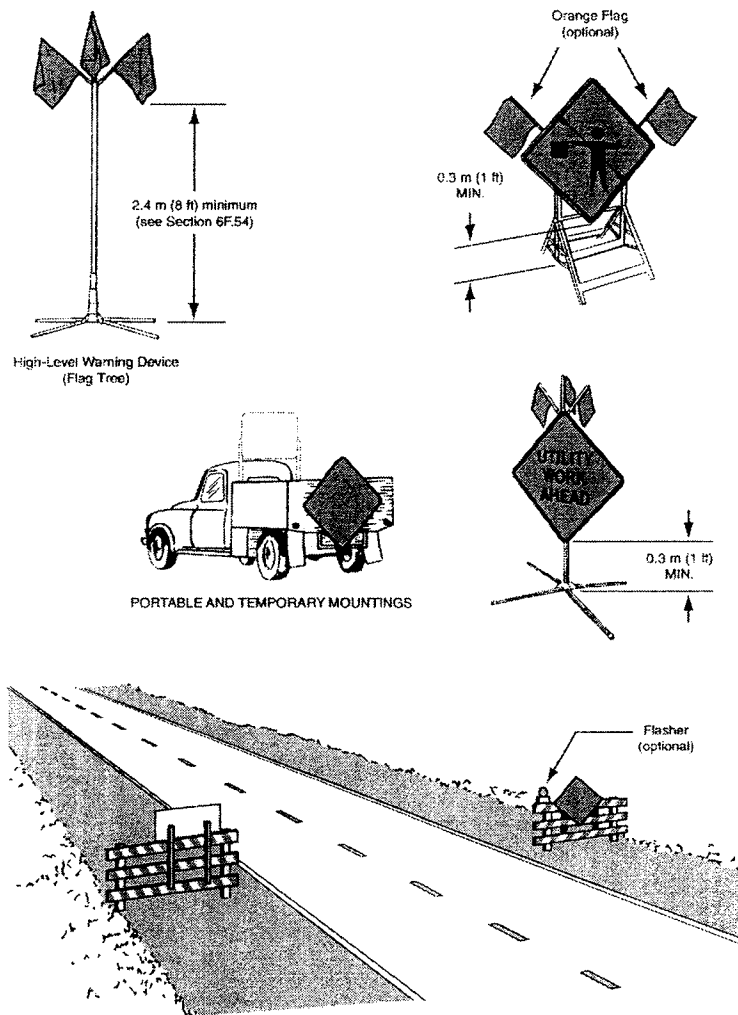
- **Post mounted signs shall be mounted at a height of:**
5 feet in rural areas
7 feet in urban areas

Figure 6F-1. Height and Lateral Location of Signs – Typical Installations



- Signs mounted on barricades, or other portable supports, shall be no less than 1 foot above the traveled way.

Figure 6F-2. Methods of Mounting Signs Other Than on Posts



Types of Signs

There are three types of signs:

- **Regulatory Signs** - are used in work zones to advise drivers of applicable **laws and regulations**. Therefore, proper authority and/or approval is needed before establishing or changing regulatory signs.

All pre-existing regulatory signs that are preempted by the temporary regulatory signs must be temporarily removed or covered to prevent motorist confusion.

- **Warning Signs** - give **notice of general or specific conditions** on or adjacent to a roadway. These signs are particularly effective when a potential hazard is not obvious or cannot be seen by the driver. These signs should not be overused or they will lose their attention-getting value. Likewise, warning signs should not be overly restrictive or they will lose credibility with drivers.

Warning signs should be placed far enough in advance of the condition to give the driver adequate time to understand the warning and to take any required action. Construction warning sign spacing is covered in chapter 6.

- **Guide Signs** – show **destinations, designations, directions, distance, services, points of interest, and other geographical or cultural information.**

The following guide signs are required at temporary traffic control zones.

- Standard route markings, where temporary route changes are necessary.
- Directional signs such as motorist service signing, recreational and cultural interest area signs, tourist-oriented directional signs, civil defense signing, and street name signs.

Construction Signs

WSDOT, Standard Specifications, M41-10

“Construction signs will be divided into two classes.

- **Class A** construction signs are those signs that remain in service throughout the construction or during a major phase of the work. They are **mounted on posts**, existing fixed structures, or substantial supports of a **semi-permanent** nature.”
- “**Class B** construction signs are those signs that are **placed and removed daily**, or are used for short durations which may extend for one or more days.”

Sign Storage

To prevent traffic sign face failure, signs should be stored according to the following:

- **Indoor Storage (preferred method)**
 - **Store signs on edge.**
 - **Signs may be packaged if kept dry.**
 - **If packaged signs become wet, unpack immediately** and separate signs to dry.
- **Outdoor Storage (not recommended)**
 - **Remove all packaging materials** so nothing is against the sign face.
 - **Do not**, under any circumstances, **lay signs flat.**
(water accumulating between signs laying flat will cause the sign sheeting to fail)
 - **Store signs upright on edge** on blocks or 2X4's to keep them off the ground.
 - **Provide space between signs** to allow air circulation and normal moisture evaporation from the face of each sign.
 - **Avoid sign face contact with treated posts.**
 - **Avoid storing signs where dirt and water may be splashed on sign face.**

5.5 PORTABLE CHANGEABLE MESSAGE SIGNS

Portable Changeable Message Signs (PCMS) are traffic control devices with the flexibility to display various messages to fit the needs of the work area. The use and design of Portable Changeable Message Signs are covered in Section 6F-52 of the MUTCD.

The following guidelines should be considered when using Portable Changeable Message Signs:

1. **Recommended for high speed, high volume roadways, or work operations that require a high visibility message.**
2. **Shall not be used to replace required signs.**
3. **Placed in advance of other temporary traffic control zone signing.**
 - Locate PCMS far enough in advance of alternate route when used to provide route diversion information.
4. **Placed on the shoulder of the roadway or, if practical, further from the traveled lane.**
5. **Should be delineated with retroreflective temporary traffic control devices or,**
6. **When within the clear zone, shielded with a barrier or crash cushion.**
7. **Should be removed; if not removed, shielded or delineated with retroreflective traffic control devices when not in use.**
8. **Should be visible for ½ mile minimum (both day and night).**
9. **Should be legible for at least 650 feet (all lanes).**
10. **Should be able to be read twice at the posted speed.**
11. **Each individual display should convey a single thought.**
12. **A complete message cycle should consist of no more than two displays in sequence.**
13. **Bottom of sign panel shall be a minimum of 7 feet above roadway.**
14. **PCMS shall automatically adjust its light source relative to surrounding conditions.**
15. **Messages shall not scroll horizontally or vertically across the sign face.**
 - Consider truck mounted PCMS for shadow vehicles.

- PCMS arrow does not meet the requirements of a Type C Arrow Panel.
- A truck mounted PCMS Arrow Panel meets the requirements of a Type B Arrow Panel generally used for mobile operations.

5.6 ARROW PANELS

Arrow Panels are intended for use in conjunction with appropriate signs, barricades, or other traffic control devices. The use and design of arrow panels are covered in Section 6F-38 of the MUTCD.

The arrow panels has a number of possible mode selections:

- **Flashing arrow**
- **Sequential arrow**
- **Sequential chevron**
- **Flashing double arrow**
- **Flashing caution**

Arrow panels provide additional advance warning and directional information to motorists when travel lanes are closed or diverted or when work is being done on the shoulder. Arrow panels are effective in encouraging drivers to leave a closed lane sooner. Factors applied to the use of arrow panels include:

1. **Required for all lane closures on multi-lane roads** (regardless of speed) except during emergencies.
2. **Placed on the shoulder of the roadway** or, if practical, further from the traveled lane.
3. **Should be delineated with retroreflective temporary traffic control devices** or,
4. **When within the clear zone, shield with a barrier or crash cushion.**

5. Should be **removed**; if not removed, shielded or delineated with retroreflective traffic control devices **when not in use**.
6. An arrow **shall not be used** on a multi-lane roadway to **laterally shift traffic**.
7. An arrow display **shall not be used on a two-lane, two-way roadway**.
8. **Do not use arrow panel for shoulder closures**.
9. **Use caution mode for shoulder closures**.
10. Only the **four corner flash** shall be used to **indicate caution**.
11. Use only **one arrow display per lane being closed** (unless used in mobile operations).
 - Arrow should be used in combination with other appropriate traffic control devices.
12. Arrow panels shall be **capable of a minimum 50 percent dimming**.
13. For stationary lane closure, the arrow panel should be **located on the shoulder** at the beginning of the taper.
14. Arrow panels should be **visible for ½ mile** minimum, depending upon arrow type and conditions.
 - An arrow display with a shadow (early warning) vehicle is allowed on mobile lane closure operations.
 - If the arrow panel is mounted on the protection vehicle, use caution mode for stationary operations.

5.7 CHANNELIZING DEVICES

Channelizing devices guide the motorist through the site, indicate hazardous areas, and exclude traffic from the actual workspace.

Channelizing devices include cones, drums, barricades, and barriers.

Designs of various channelizing devices shall be as shown in Figure 6F-4 of the MUTCD.

Channelizing devices are placed in or adjacent to the roadway to guide traffic. **They serve the following purposes:**

- **As a taper to move traffic from one lane to another,**
- **To reduce the width of the traveled way,**
- **To delineate and guide the driver to and along a safe path,**
- **To separate traffic from the work space, pavement drop-offs, pedestrian paths, or opposing directions of traffic, and**
- **To mark or provide warning of hazards.**

Cones and Tubular Markers (Tubes)

- **Minimum height is 18 inches for daytime operations on low-speed roadway operations only.**
- **28 inches shall be the minimum height of cones for freeways and other high-speed roadways and for all roads during hours of darkness or whenever more conspicuous guidance is needed. Taller cones may be used to improve visibility.**
- **For nighttime use, cones and tubes shall be retroreflectorized.**

Drums

- **Shall be made of lightweight, flexible, and deformable materials.**
- **Dimensions are a minimum of 36 inches high and a minimum of 18 inches in width.**
- **Stripes must be 4 inches to 6 inches wide, and a retroreflective material must be used.**
- **A minimum of two orange and two white horizontal, circumferential retroreflective stripes.**
- **Drums shall have closed tops that will not allow collection of roadwork debris.**

- **Metal drums shall not be used.**
- **Ballast shall not be placed on top of a drum.**

Barricades

A barricade is a portable or fixed device having from one to three rails with appropriate markings and is used to control road users by closing, restricting, or delineating all or a portion of the right-of-way.

Barricades should be constructed of lightweight materials and have no rigid stay bracing for A-frame designs. They shall be one of three types: Type I, Type II, or Type III. Characteristics of these types are shown in Figure 6F-4 in the MUTCD.

- Barricades facing traffic shall have the following number of retroreflective rail faces:

Type I: One for each direction needed.

Type II: Two for each direction needed.

Type III: Three for each direction needed.

- **Type I and II barricades are intended for situations where traffic is maintained through the work area.**
- **Type III barricades are generally used to close a road.**
- **Stripes on barricades shall slope downward at a 45 degree angle in the direction traffic is to pass.**

5.8 PORTABLE BARRIERS

There are four primary functions of barriers:

- **Keep traffic from entering work space;**
- **Provide protection for workers;**
- **Separate two-way traffic; and**

- **Protect construction** such as falsework for bridges and other exposed objects.

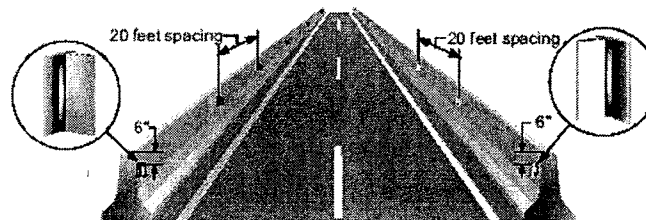
Concrete Barriers

A semi-rigid barrier designed to prevent intrusion of errant vehicles into work areas. Recommended for long term stationary work areas with high exposure to traffic.

Consider the following for use of concrete barriers.

- **Areas where there is a high potential for injury to workers** or “no escape” areas such as internal lane work, work zones in tunnels, bridges, lane expansion work, etc..
- **Long term, stationary jobs.**
- **Areas of high exposure to workers and motorists** such as high speed and high volume of traffic.

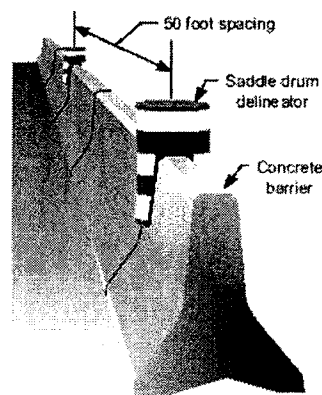
Concrete barrier delineator



Concrete Barrier Delineators

Note: Color of delineator matches color of adjacent edge line.

Saddle Drum Delineator



Saddle Drum Delineators

Water Filled Barriers

Water filled barriers are longitudinal barrier systems that use light-weight modules pinned together and filled with water to form a barrier. They are **not intended as a replacement for concrete barriers**.

Two different systems (Triton and Guardian) have been tested and approved for WSDOT use.

Caution: Depending upon vehicle speed and potential angle of impact, a **lateral deflection space of up to 23 feet can be required** behind the barrier.

Evaluate risk and site conditions, and if used, **follow the manufacturer's specifications and recommendations**. Contact the Region Traffic Office, or OSC Design Office, for advise on use of this device and assistance in determining the deflection space requirement behind the barrier.

Do not use in lane transitions unless the situation meets with manufacturer's specifications, and **ensure approach ends are crashworthy**, or are protected with a TMA.

5.9 WORK VEHICLES

Work Zone Vehicle – All vehicles used within the work zone **must be equipped with an approved warning beacon**. **Consideration** must be **given to the location of workers in relation to the work vehicles**.

Protective Vehicle –Usually a stationary vehicle (in stationary work zones) **strategically placed in advance of the work area, between the buffer space and the roll ahead space, to protect workers** from oncoming traffic. The use of **a Truck Mounted Attenuator (TMA) on this vehicle is recommended** (refer to the M54-44 for more detailed information).

Shadow Vehicle – Very similar to the protective vehicle but usually a moving vehicle (**mobile work zones**). All of the guidelines for the protective vehicle apply to the shadow vehicle. **A sequential arrow or truck mounted Portable Changeable Message Sign (PCMS) may also be used on the shadow vehicle**.

5.10 IMPACT ATTENUATORS

Impact attenuators are systems that **mitigate the effects of errant vehicles that strike hazards**, Either by smoothly decelerating the vehicle to a stop when hit head-on, or by redirecting the errant vehicle. Impact attenuators in temporary

traffic control zones protect the motorist from the exposed ends of barriers, fixed objects, and other hazards.

Two types of impact attenuators used in temporary traffic control zones are Roadside Attenuators and Truck Mounted Attenuators (TMAs).

Truck-Mounted Attenuators (TMA)

Recommended for high speed work zone protection. If a TMA is not available, the use of a protective or shadow vehicle is still highly recommended.

Consider the following for determining TMA use:

- **Speed of traffic**
- **Type of activity**
- **Duration of project**
- **Roadway environment**
- **Traffic volumes**
- **Exposure to special hazards**
- **Location of work area**
- **Roll ahead distance**

(Extracted from page 6, of the M54-44, Work Zone Traffic Control Guidelines -May 2000)

Priorities for the Application of Truck Mounted Attenuators (TMA)

Closure / Exposure Condition	Priority			
	Freeway	Non-Freeway with Speed Limit		
		> 50 mph	40-45 mph	< 35 mph
No Formal Lane Closure				
Shadow Vehicle for Operation Involving Exposed Personnel	*1	2	3	4
Shadow Vehicle for Operation Not Involving Exposed Personnel	1	2	3	4
No Formal Shoulder Closure				
Shadow Vehicle for Operation Involving Exposed Personnel	2	3	3	3
Shadow Vehicle for Operation Not Involving Exposed Personnel	2	3	4	5
Formal Lane Closure				
Protective vehicle for Operation Involving Exposed Personnel	2	3	4	5
Protective vehicle for Condition Involving Significant Hazard	2	3	4	5
Formal Shoulder Closure				
Protective vehicle for Operation Involving Exposed Personnel	3	4	5	5
Protective vehicle for Condition Involving Significant Hazard	3	4	5	5

* The numerical rank indicates the level of priority assigned to the use of a TMA on an assigned shadow/protective vehicle. The use of a TMA under the defined condition is:

1. very highly recommended
2. highly recommended
3. recommended
4. desirable
5. may be justified on the basis of special conditions encountered on an individual project

5.11 PAVEMENT MARKINGS

The provisions of this Section **shall not be considered applicable for short-term, mobile, or incident management** temporary traffic control zones.

Factors applied to the use of Pavement Markings include:

- Pavement markings shall be maintained along paved streets and highways in **all long- and intermediate-term stationary temporary traffic control zones.**
- Pavement markings **shall match the markings in place at both ends** of the temporary traffic control zone.
- All pavement markings shall be in accordance with MUTCD, Chapters 3A and 3B, except as indicated in Section 6F.66 of the MUTCD.
- Pavement markings **shall be placed along the entire length** of any surfaced detour or temporary roadway **prior to the detour or roadway being opened** to road users.
- Warning signs, channelizing devices, and delineators shall be used to indicate required road user paths in temporary traffic control zones where it is not possible to provide a clear path by pavement markings.
- All pavement markings and devices used to delineate road user paths **shall be carefully reviewed during daytime and nighttime** periods.
- For long-term stationary operations, pavement markings in the temporary traveled way that are no longer applicable shall be removed or obliterated as soon as practical.
- Road users **should be** provided pavement markings within a temporary traffic control zone **comparable to the pavement markings normally maintained** along such roadways, particularly at either end if the temporary traffic control zone.
- The intended vehicle path should be defined in day, night, and twilight periods under both wet and dry pavement conditions.

- The work should be planned and staged to provide for the placement and removal of pavement markings.
- Markings should be provided in intermediate-term, stationary work zones.
- Removable, non-reflective, preformed tape may be used where markings need to be covered temporarily.

MUTCD, WSDOT Modifications Temporary Pavement Markings

Temporary pavement markings are those that may be used until it is practical and possible to install permanent pavement markings that meet **MUTCD**.

- Normally, it should not be necessary to leave temporary pavement markings in place for more than 2 weeks, except on roadways being paved with Bituminous Surface Treatment (BST) and having traffic volumes under 2,000 ADT. All Temporary pavement markings including pavement markings for no passing zones shall conform to the requirements of sections 3A and 3B.
- All temporary pavement markings, including pavement markings for no-passing zones, shall conform to the requirements of **MUTCD, Chapter 3A and 3B**.
- All temporary broken-line pavement markings shall use the same cycle length as permanent markings and be at least 2 feet long.
- Half-cycle lengths with a minimum of 2 foot stripes may be used on roadways with severe curvature. This applies to centerlines in passing zones and lane lines.
- For temporary situations of 14 calendar days or less, for a two- or three-lane road, no-passing zones may be identified by using **W14-3 NO PASSING ZONE** (see section 2C.32) signs rather than pavement markings (see section 3B.02).
- Signs may be used in lieu of pavement markings on low-volume roads for longer periods when this practice is in keeping with the state or other highway agency's policy. The signs should be placed in accordance with sections 2B-24 and 2B.25.

Raised Pavement Markers

If raised pavement markers are used to substitute for broken line segments, at least two retroreflective markers shall be placed, one at each end of a segment of 2 to 5 feet. For segments over 5 feet, a group of at least three retroreflective markers shall be equally spaced at no greater than N/8. The value of N for a broken or

dotted line shall equal the length of one line segment plus one gap. The value of N referenced for solid lines shall equal the N for broken lines (see **Chapter 3B of the MUTCD**).

Raised pavement markers should be considered for use along surfaced detours or temporary roadways, and other changed or new travel-lane alignments.

Retroreflective or internally illuminated raised pavement markers, or nonretroreflective raised pavement markers supplemented by retroreflective or internally illuminated markers, may replace or supplement markings prescribed in Chapters 3A and 3B of the MUTCD.

Removal of Pavement Markings

- **Pavement marking obliteration shall leave a minimum of pavement scars and shall remove old marking material.**
- **Painting over existing pavement markings with black paint or spraying with asphalt shall not be acceptable as a substitute for removal or obliteration.**
- **Removable, nonreflective, preformed tape may be used where markings need to be covered temporarily.**

5.12 LIGHTING

It is often desirable and necessary to supplement signs, barriers and channelizing devices with lighting devices. These devices are especially effective at night, and the more powerful devices are powerful attention-getting devices during the day also.

Temporary traffic control activities often create conditions on or near the traveled way that are particularly unexpected at night, when drivers' visibility is sharply reduced. It is often desirable and necessary to supplement retroreflective signs, barriers, and channelizing devices with lighting devices.

Four types of lighting devices are commonly used:

- **Floodlights,**
- **Hazard identification beacons,**

- **Steady-burning electric lamps, and**
- **Warning lights**

Floodlights

When **nighttime work** is required the following points are important:

- **Flagging stations must be illuminated with floodlights** during hours of darkness.
- **Floodlights should be used to illuminate areas where existing light is not adequate** for the work to be performed safely.
- **Floodlighting shall not produce a disabling glare** condition for approaching road users.
- When floodlights are used, **the driver's path past the work area should also be illuminated**

Flashing Identification Beacons (Flashing Electric Lights)

A flashing identification beacon is a flashing yellow light (minimum diameter, 8 inches) used to alert drivers' attention to special conditions. When used, the flashing beacon should operate 24 hours a day.

On temporary traffic control projects, because of the time and effort required to install these units and put them into operation, they are generally used at locations where frequent changes would not be required.

Flashing identification beacons may be used singly or in groups containing more than one unit.

During normal daytime maintenance operations, the functions of flashing beacons are adequately provided by rotating dome or strobe lights on maintenance vehicles. Flashing beacons mounted on maintenance vehicles must always be visible to approaching motorists even when the truck box is up or other maintenance activity is in progress.

Flashing beacons may also be installed at locations where maintenance activity requires an obstruction to remain in the roadway at night.

Steady-Burning Electric Lamps

- Steady-Burn electric lamps are a series of low-wattage, yellow, electric lamps, generally hard-wired to 110-volt external power source.

Steady-Burn electric lamps may be used in place of Type C Steady-Burn warning lights.

Warning Lights

Warning lights shall have a minimum mounting height of 30 inches to the bottom of the lens. Note that the 30-inch mounting height is approximately the windshield height of passing vehicles. Therefore special care should be taken to ensure that warning lights are securely attached so that in the event of a crash, they do not separate from their support and enter the passenger compartment.

There are three types of warning lights:

- **Type A - low-intensity flashing warning lights** are most commonly mounted on barricades, drums, vertical panels, or advanced warning signs, and are intended to warn drivers that they are approaching or in a hazardous area.
- **Type B - high-intensity flashing warning lights** are normally mounted on advance warning signs or on independent supports. Extremely hazardous site conditions within temporary traffic control zones may require that the lights be effective in daylight as well as dark. They are designed to operate 24 hours per day.

Flashing lights are not to be used for delineating the travel path of vehicles because they may confuse the driver and obscure the desired vehicle path.

- **Type C – steady-burn lights** are intended to be used to delineate the edge of the traveled way on detour curves, on lane changes, on lane closures, and in other situations as determined by engineering judgment.

5.13 SUPPLEMENTAL DEVICES

Traffic Control Signals

Temporary traffic control signals are typically used in work zones such as temporary haul road crossings; temporary one-way operations along a one-lane, two-way highway; temporary one-way operations on bridges, reversible lanes, and intersections.

Temporary traffic control signals used to control road user movements through temporary traffic control zones and in other temporary traffic control situations shall meet the applicable provisions of Parts 4 and 6 of the MUTCD.

Rumble Strips

Rumble strips consist of intermittent narrow, transverse areas of rough-textured or slightly raised or depressed road surface that alert drivers to unusual motor vehicle traffic conditions. Through noise and vibration they attract the driver's attention to such features as unexpected changes in alignment and to conditions requiring a stop.

Intervals between rumble strips may be reduced as the distance to the approached conditions is diminished in order to convey an impression that a closure speed is too fast and/or that an action is imminent. A sign warning drivers of the onset of rumble strips may be placed in advance of any rumble strip installation.

Rumble strips should be placed transverse to motor vehicle traffic movement. They should not adversely affect overall pavement skid resistance under wet or dry conditions.

In urban areas, even though a closer spacing might be warranted, care should be taken not to promote panic braking or erratic steering maneuvers by drivers.

Rumble strips should not be placed on sharp horizontal or vertical curves.

Screens

Screens are used to block the road users' view of activities that can be distracting. Screens might improve safety and motor vehicle traffic flow where volumes approach the roadway capacity because they discourage gawking and reduce headlight glare from oncoming motor vehicle traffic.

Screens should not be mounted where they could adversely restrict motorist visibility and sight distance and adversely affect the safe operation of vehicles.

Screens may be mounted on top of temporary traffic barriers that separate two-way motor vehicle traffic.

Design of screens should be in accordance with Chapter 9 of AASHTO's "Roadside Design Guide" (see Section 1A.11)

Fencing

Various types of fencing materials have been introduced by manufacturers to delineate work spaces in an attempt to protect them from intrusion by unauthorized personnel. These fences are made of plastic or polyethylene and consist of mesh fabrics which usually are orange in color. Some of the fencing materials are supplemented with retroreflective sheeting to enhance their brightness at night.

Fences are supplements to standard warning devices and may be used around excavations, material storage areas, or other hazards associated with work activities. They are especially effective for pedestrian control and are sometimes used to delineate walkways and bicycle paths through temporary traffic control zones and in conjunction with utility operations.

CHAPTER 6

ELEMENTS OF TRAFFIC CONTROL PLANS

6.1 SUMMARY

This chapter describes the four component parts of temporary traffic control zones and discusses the use of various traffic control devices to produce a complete traffic control system. The selection of traffic control devices, and the required spacing of devices for each of the component parts will be addressed.

6.2 TEMPORARY TRAFFIC CONTROL ZONE

A temporary traffic control zone, also referred to as a work zone, extends from the first warning sign the motorist encounters through the last traffic control device, where traffic returns to its normal path and conditions. **Most work zones can be divided into the following four areas:**

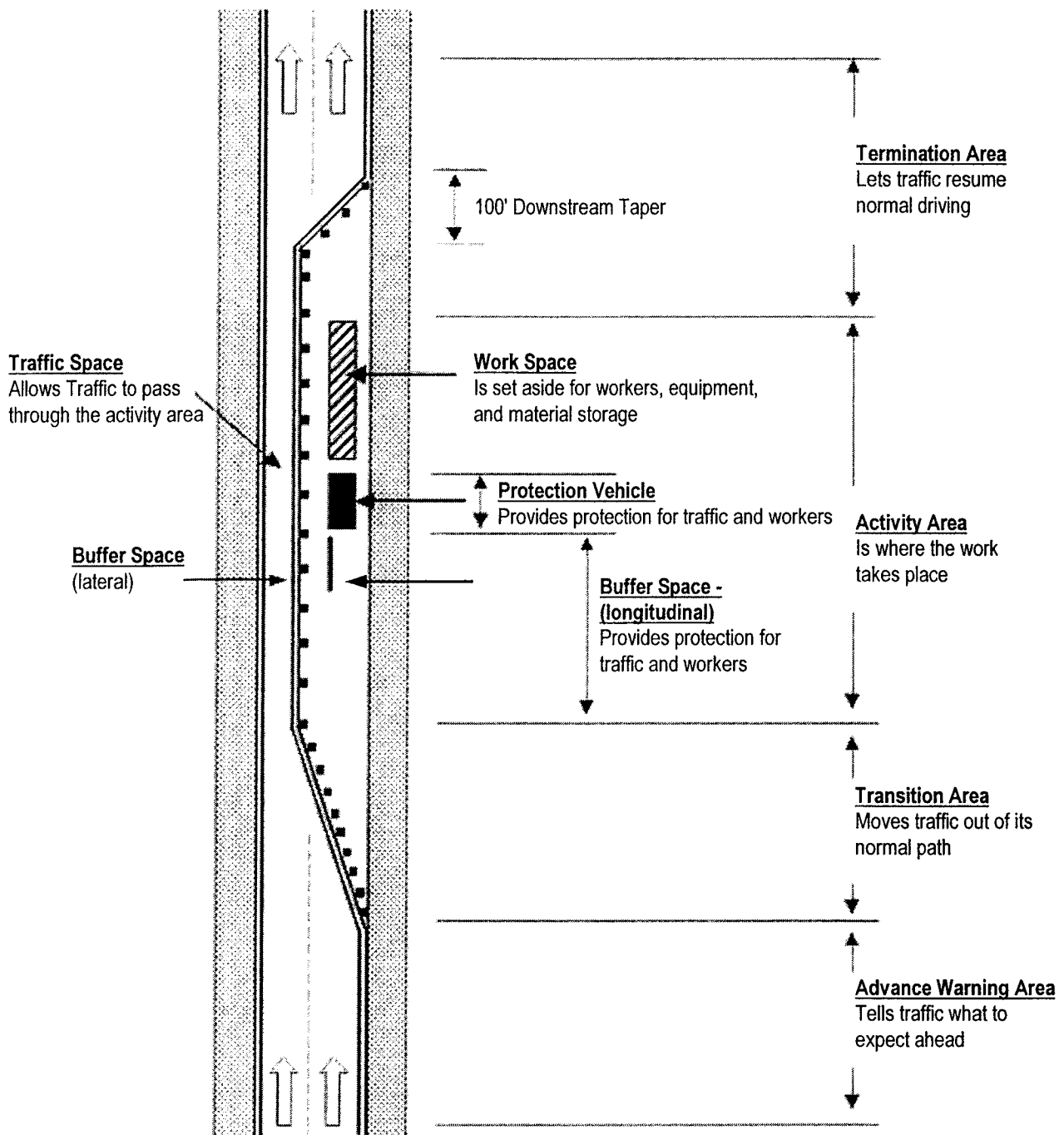
- **Advance Warning Area**
- **Transition Area**
- **Activity Area**
- **Termination Area**

The Activity Area can be further divided into sub-areas which are called:

- **Work Space**
- **Traffic Space**
- **Buffer Space**
 - Longitudinal Buffer Space
 - Lateral Buffer Space

The MUTCD, Figure 6C-1, illustrates these areas and subareas for a typical - unidirectional traffic control zone. It should be noted that these four work areas will exist in almost all work zone situations, whether they be stationary, long or short term, related to utility operations, emergency situations, incident management conditions, as well as mobile operations. The specific field treatment

and selection of traffic control devices will depend on the character of the operation involved.



6.3 ADVANCE WARNING AREA

An advance warning area is necessary for all work zones because it **alerts the motorist to an unexpected situation and informs him/her of what to expect.** The advance warning can vary from a single sign or flashing lights on a vehicle to a series of signs giving specific information of the nature of the work ahead and instructions of the expected motorist action. **Drivers must have enough time to read and comprehend the messages** contained on advance warning signs **and be given enough time to react to these messages.** Warning signs are the most common systems of traffic control devices used in the advance warning area.

Warning Sign Series

Diamond-shaped warning signs are used to inform motorists about the potential hazards they are approaching, provide information about conditions ahead, and detail actions which must be taken to safely travel through the temporary traffic control zone. On highways in open country and where travel speeds are moderate to high, a minimum of three advance warning signs are typically employed. The purpose of these signs are:

- The **first sign** in the series, as encountered by the driver, **attracts the motorist's attention** and warns of the roadway work site ahead. The sign may specify the distance to the work area or may contain the message "AHEAD."
- The **second sign** **provides more detailed information** about the situation ahead and advises drivers of changes in the travel path, if any. For example, it may tell the motorist if a road is closed, if traffic is detoured, if the number of lanes is reduced or if their widths is narrowed, etc. Specific information about distance to the condition may be indicated on the sign.
- The **third sign** in the series **advises the motorist of the specific action to be taken.**

The most common message displayed on the first advance warning sign in construction and maintenance areas is ROAD WORK AHEAD (or ROAD WORK XXX FEET), but other legends are acceptable as illustrated in Part VI of the MUTCD.

Typical Sign Series

A typical lane closure on a **two-lane, two-way rural highway with high operating speeds** would consist of an advance warning sign series of **four signs** containing the messages:

- **ROAD WORK AHEAD**
- **ONE LANE ROAD AHEAD**
- **BE PREPARED TO STOP**
- **FLAGGER AHEAD (or the flagger symbol)**

On a **high-speed multilane** facility, where the work operation requires **closure of the right traffic lane** in one direction and there is no flagger present, the warning sign sequence may consist of **three signs**:

- **ROAD WORK AHEAD**
- **RIGHT LANE CLOSED AHEAD**
- **TRANSITION SYMBOL**

In each of these situations, the information given to the motorist becomes more specific as to the nature of the work and the needed motorist action as he/she proceeds through the advance warning area.

Suggested Sign Spacing

Signs must be spaced **far enough apart** so that the **driver can read the sign, understand the message, and take the appropriate action** before being presented with the next sign or traffic control device. Therefore, **drivers should have from 3 to 10 seconds to respond** to the message, and may need even more time if they also have to interact with other vehicles in heavy traffic.

The suggested distances between signs are as follows:

WAC 468-95-300, WSDOT Amendments to the MUTCD					
Road Type	Speed	Distance Between Signs			
		A	B	B	C
Freeways & Expressways	55/70 mph	1500'	1500'	1500'	1500'
		(or per MUTCD)			
Rural Highways	60/65 mph	1000'	1000'	1000'	1000'
Rural Roads	45/55 mph	500'	500'	500'	500'
Rural Roads & Urban Arterials	35/40 mph	350'	350'	350'	350'
Rural Roads, Urban Streets, Residential Business Districts	25/30 mph	200'	200'	200'	200'
		(see note 2)			
Urban Streets	25 mph or less	100'	100'	100'	100'
(1) All spacing may be adjusted to accommodate interchange ramps, at-grade intersections, and driveways.					
(2) This spacing may be reduced in urban areas to fit roadway conditions.					
WAC 296-155-305, L&I Rules, required when Flaggers are present!					
		A	B	C	D
Urban low speed*	25/30 mph	200'	200'	200'	200'
Urban high speed*	35/40 mph	350'	350'	350'	350'
Rural	45/55 mph	500'	500'	500'	500'
Expressways/Freeways	55/65 mph	1000'	1600'	2600'	2600'
* Speed category to be determined by Washington State Department of Transportation in cooperation with local jurisdictions.					

Adjustments to the suggested sign spacing distances may also be made in response to specific field conditions or operational characteristics. On high speed highways in open country it may be advisable to increase sign spacing to give the motorist more response time while still maintaining the driver's attention. Conversely, it may be necessary to decrease the sign spacing in urban situations where intersections, driveway locations, and other considerations make it impractical to maintain the suggested sign spacing dimensions. Advance warning distances may also be increased by installing additional signs giving more specific information or by repeating messages.

Special Considerations for Advance Warning Areas

Adjustments in locating the advance warning area for a given temporary traffic control zone may be necessary if special problems are encountered. Situations which may call for such adjustments include:

- **Urban Locations** - The spacing between signs may have to be adjusted due to the length of city blocks. Intersections, alleys, shopping center access points, and side streets also may require additional signs and modified sign spacing.
- **On-Street Parking** - The mounting height of signs may have to be increased so that they are visible over parked vehicles.
- **Commercial Establishments** - Sign locations may have to be adjusted to avoid their being obstructed by existing commercial signs, interfere with loading zones, or be blocked by delivery vehicles.
- **Rural Open Highways** - Warning distances may have to be increased to accommodate higher speeds or larger signs may be needed to increase their conspicuity.
- **Divided Highways and One-way Street With Two or More Lanes** - Consideration should be given to installing signs on both sides of the roadway to assure that the messages are visible to all approaching traffic and to minimize the possibility of blocking the view of signs by vans and trucks. Existing overhead sign structures may be suitable for mounting advance warning signs and to indicate temporary ramp closures.
- **Existing Signs** - Work zone signs should be located such that they do not interfere with existing permanent signs which must remain in effect, and vice versa. Those existing signs which are not applicable during the road work activity should be covered or removed. Whenever existing signs are retained during work activities, the spacing between these signs and the temporary traffic control signs must be adjusted so as not to overload the driver's ability to comprehend and respond to all signs in the system.

6.4 TRANSITION AREA

In the transition area of a work zone, traffic is moved from the normal highway lanes into a path which **channelizes vehicles safely around the work area**. This is usually necessary when work is performed in one or more of the travel lanes and a lane closure is required. A transition area may involve a reduction of the number

of lanes through the work area, but it may also entail a shift of traffic without a lane reduction or the temporary closure or narrowing of the shoulder of a highway.

Reference MUTCD 2000

“When redirection of the road users’ normal path is required, they shall be channelized from the normal path to a new path.”

Selection of appropriate traffic control devices is critical to delineate the temporary roadway during daylight hours, at night, and during inclement weather.

Transitions are usually marked by channelizing devices and pavement markings, or both, and typically involve the strategic use of tapers. In mobile operations, the transition area moves with the work space, and a moving shadow vehicle equipped with signs, flashing lights and flags is used to guide traffic into the proper lane around the activity.

Roadway Tapers

Roadway tapers are an important element of temporary traffic control and are **used to move traffic laterally from one path to another**. They are used in the transition and termination areas and are created with a series of channelizing devices and pavement markings. The following **five types of tapers** are used in temporary traffic control zones:

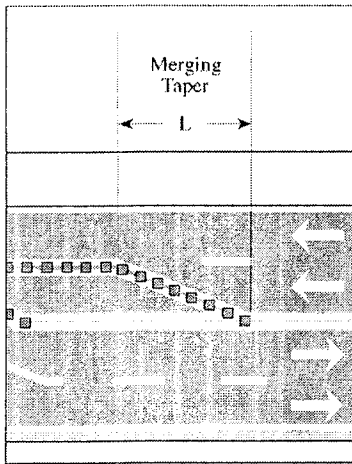
- **Merging taper**
- **Shifting taper**
- **Shoulder taper**
- **One-Lane, Two-way traffic taper**
- **Downstream taper**

MUTCD 2000

Table 6C-2. Taper Length Criteria for Temporary Traffic Control Zones

Type of Taper	Taper Length (L)*
Merging Taper	at least L
Shifting taper	at least 0.5L
Shoulder Taper	at least 0.33L
One-Lane, Two-Way Traffic Taper	30 m (100 ft) maximum
Downstream Taper	30 m (100 ft) per lane

Merging Taper = L minimum



Merging tapers are used to move traffic laterally from its normal lane to merge with an adjacent lane of traffic at prevailing travel speeds. They require the longest distances because they must be long enough to enable drivers to adjust their speeds and merge into a single lane before the end of the transition. Lengths of merging tapers are determined by the posted speed limit of the highway, the off-peak 85th percentile speed prior to the start of the work, or the anticipated operating speed. The computational methods for determining the minimum length of merging taper (L) are as follows:

Taper Length Formulas

- for speeds of 45 mph or greater

$$L = W \times S$$

- for speeds of 40 mph or less

$$L = \frac{W \times S^2}{60}$$

L = the length of the taper in feet

W = the width of the offset (usually a lane width) in feet

S = the posted speed, off-peak 85th percentile speed prior to beginning of work, or the anticipated operating speed in mph.

Finding "L" Table

Finding "L" (Merging Taper)												
S P E E D M P H	OFFSET/LANE WIDTH											
		2	3	4	5	6	7	8	9	10	11	12
	20	15	20	30	35	40	50	55	60	70	75	80
	25	25	35	45	55	65	75	85	95	105	115	125
	30	30	45	60	75	90	105	120	135	150	165	180
	35	45	65	85	105	125	145	165	185	205	225	245
	40	55	80	110	135	160	190	215	240	270	295	320
	45	90	135	180	225	270	315	360	405	450	495	540
	50	100	150	200	250	300	350	400	450	500	550	600
	55	110	165	220	275	330	385	440	495	550	605	660
	60	120	180	240	300	360	420	480	540	600	660	720
	65	130	195	260	325	390	455	520	585	650	715	780
	70	140	210	280	350	420	490	560	630	700	770	840

TAPER/CHANNELIZING DEVICE TABLE
 MERGING, SHIFTING & SHOULDER TAPER LENGTHS
 AND NUMBER OF CHANNELIZATION DEVICES USED
 (Washington State Department of Transportation)

(All Minimums)

Lane Width	10 feet				11 feet				12 feet				Shoulder Tapers (Assumes 10' Shoulders)		
	L		1/2L		L		1/2L		L		1/2L		1/3L		
	MPH	Merging	Devices	Shifting	Devices	Merging	Devices	Shifting	Devices	Merging	Devices	Shifting	Devices	MPH	(ft) Length
20	70	5	35	3	75	5	40	3	80	5	40	3	20	25	3
25	105	6	55	4	115	7	60	4	125	7	65	4	25	35	3
30	150	8	75	5	165	9	85	5	180	10	90	5	30	50	3
35	205	8	105	5	225	9	115	5	245	9	125	5	35	70	4
40	270	10	135	6	295	11	150	6	320	12	160	6	40	90	4
45	450	16	225	9	495	18	250	9	540	19	270	10	45	150	6
50	500	14	250	8	550	15	275	8	600	16	300	9	50	170	6
55	550	15	275	8	605	16	305	9	660	18	330	9	55	185	6
60	600	16	300	9	660	18	330	9	720	19	360	10	60	200	6
65	650	17	325	9	715	19	370	10	780	21	390	11	65	220	7
70	700	19	350	10	770	20	385	11	840	22	420	12	70	235	7

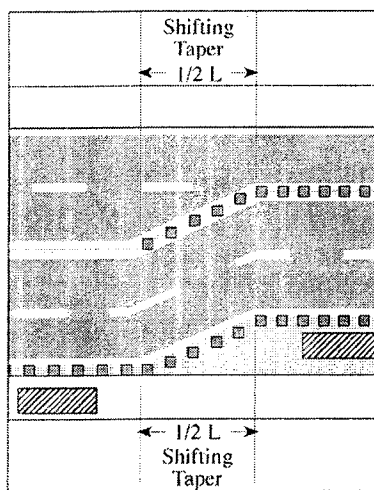
*L for shoulder taper equals
Shoulder Width x Speed. Figures
shown are for a 10' shoulder

(Extracted from page 14, of the M54-44, Work Zone Traffic Control Guidelines - May 2000)

Lengths of tapers may be adjusted whenever they are used near interchange ramps, crossroads, curves, and other influencing factors. High-speed operations on freeways and expressways may call for longer tapers if merging problems are observed in the transition areas. In urban situations it may be necessary to shorten tapers at driveways, for short block length, and similar conditions. The real test of the adequacy of the taper length involves observation of driver performance after the traffic control plan is put into effect.

When it is necessary to close two or more adjacent lanes on a one-way roadway, the merging tapers for each lane to be closed must be separated along the highway to separate the merging conflicts associated with each of the lane closures. **A minimum length of two times the taper length for each lane closure (2L) is used to allow traffic to become stabilized after each merging maneuver** (MUTCD, Figure 6H-37 or M54-44, TCP 3, page 18). This separation distance of 2L is measured from the end of the first taper to the beginning point of the second taper, and is repeated for each successive lane closure.

Shifting Taper = $\frac{1}{2}$ L minimum



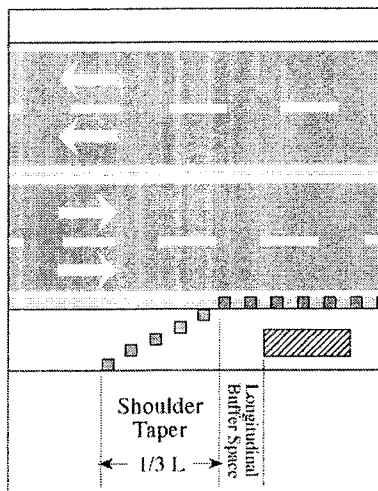
A shifting taper is used when traffic is moved laterally into a different travel path but the number of through lanes is not reduced. In these situations a merge with adjacent traffic is not required. A taper of approximately one-half the length of the merging taper ($\frac{1}{2} L$) has been found to be adequate to accommodate this movement (Figure 6C-2, MUTCD). Where more space is available, it may be beneficial to use longer taper lengths and the full value of L is frequently used in these situations. The maximum spacing of channelizing devices (in feet) should be equal to the speed limit (in miles per hour). WSDOT has adopted closer channelizing device spacing (see "Channelizing Device Spacing")

The value of W to be used in computing the length of shifting tapers should be the width of the lateral shift involved. To the degree practicable, changes in alignment of this type should be accomplished by using horizontal curves designed for normal highway speeds.

In a control configuration where a lane closure is followed by a lane shift, the spacing between the two tapers should be a minimum of $1/2 L$ to allow traffic to stabilize between transition movements. The tangent distance of $1/2 L$ is adequate in this instance because no merging maneuver is required at the lane shift (MUTCD, Figure 6H-32).

Whenever field observations of the completed taper installations indicate operational difficulties, such as erratic maneuvers, frequent use of brakes, skid marks, and displaced channelizing devices consideration should be given to increasing taper lengths. The advance warning signs should also be reviewed to determine if information provided to the motorist concerning the impending lane shift is adequate.

Shoulder Taper = $1/3 L$ minimum



A shoulder taper is **used when work activities on the improved require the temporary closure of the shoulder**, a taper length of approximately one-third the length of the merging taper ($1/3 L$) should be used (Figure 6C-2, MUTCD). This treatment is necessary because drivers normally expect to be able to use the shoulder in an emergency. If the shoulder is used as a travel lane, either through practice or during temporary traffic activity, a normal merging or shifting taper should be provided.

One-Lane, Two-Way Traffic Taper = 100 feet maximum

The two-way traffic taper is **used in advance of an activity area on a two-lane roadway where a portion of the road must be closed in such a way that the remaining roadway must alternately accommodate traffic in both directions**. The purpose of this taper is to alert drivers of potential head-on conflicts. Typically, traffic is controlled by a flagger or a temporary traffic signal, but there are instances where traffic is relied on to be self-controlling such as on low-speed, low-volume

minor roads. A **short taper having a maximum length of 100 feet** is used to guide traffic into the one-way section (Figure 6C-3, MUTCD).

The function of this taper is not to merge traffic, but to slow or stop traffic by giving the appearance of restricted alignment. **Spacing of channelizing devices should be 20 feet or less in these situations.**

Locations of two-way traffic tapers should be carefully selected relative to the activity area and the geometrics of the roadway. To be effective, the taper must be clearly visible to approaching motorists and not be obstructed by horizontal or vertical curves, buildings, vegetation, or other roadside features. Consideration should also be given to the extent of the queues which will be generated as a result of the one-way operation and the probable end of the queue of stopped vehicles relative to the advance warning area. It may be necessary to shift the location of the taper by adjusting the distance between the activity area and the taper installation.

6.5 ACTIVITY AREA

The activity area is that **area of the roadway in which the actual work takes place** and which contains buffer spaces designed to enhance the safety of motorists as well as workers. It is composed of the work and traffic space, and may contain one or more buffer spaces. These subareas of the activity area will be discussed in the sequence in which motorists encounter them as they travel through the temporary traffic control zone.

The spacing of channelizing devices through the activity area (tangent section) should not exceed 80 feet on high speed roadways and 60 feet on 35/45 mph roadways. Closer spacing may be needed to properly delineate the path for vehicular use or to keep vehicles out of the work space. Low-speed roadways and urban work zones frequently require closer spacing of devices.

Buffer Space

Buffer spaces are **optional** features of activity areas which **separate traffic from the work activity** or potentially hazardous areas **and provide recovery spaces for errant vehicles**. They provide a margin of safety for motorists and workers by giving the motorist, who has failed to properly respond to the advance warning messages or transition areas, the opportunity to stop his or her vehicle before entering the work area proper. In order to effectively serve this purpose, buffer spaces **must not be used for the storage of vehicles, equipment, supplies or any other obstructions, nor for any work activity**. In the case of mobile operations, the buffer space is the area between the shadow vehicle, if one is used, and the work crew.

- **Longitudinal Buffer Space** is placed in advance of the work area and is measured from the end of the transition area to the beginning of the work space. If a protection vehicle is stationed in advance of the work space, only the space upstream of the vehicle constitutes the buffer space. Guidelines for the lengths of longitudinal buffer spaces, as a function of speed, are shown in the WSDOT-M54-44.

A longitudinal buffer space should also be used where a closed lane separates opposing traffic flows as depicted in Figure 6C-2 of the MUTCD. In these situations, the buffer space separates the tapers for opposing directions of traffic and could help prevent head-on collisions. Typically, this buffer space is formed as a traffic island and defined by channelizing devices.

The length of longitudinal buffer spaces may be adjusted to satisfy the requirements of individual highway agencies.

- **Lateral Buffer Space** may be used to separate the traffic space from the work space or a potentially hazardous area, such as an excavation or pavement drop-off. It may also be used effectively between two travel lanes, especially those carrying opposing traffic. The width of lateral buffer spaces should be determined by engineering judgement, and care should be taken to design and delineate this space so as to discourage its use as a traffic lane. WSDOT-M54-44 suggests maintaining a 2-foot lateral buffer space where practicable.

Protection Vehicle

A work vehicle strategically placed in advance of the work area, between the buffer space and the roll ahead space, to protect workers from oncoming traffic. If a protection vehicle is stationed in advance of the work space, only the space upstream of the vehicle constitutes the buffer space. WSDOT recommends the use of a protection vehicle. The protection vehicle should be equipped with a Truck Mounted Attenuator (TMA) on high speed operations.

Guidelines for the lengths of Longitudinal Buffer Spaces and Protection Vehicle Roll Ahead distance are shown on the next page:

WSDOT, M54-44

BUFFER DATA										
BUFFER SPACE = B										
SPEED (MPH)	25	30	35	40	45	50	55	60	65	70
LENGTH (FT)	55	85	120	170	220	280	335	415	485	585
PROTECTIVE VEHICLE ROLL AHEAD DISTANCE = R*										
VEHICLE TYPE	TYPICAL VEHICLE LOADED WEIGHT (LBS)			POSTED SPEED (MPH)		STATIONARY OPERATION (FT)		*VALUES MAY BE REDUCED IN ACCORDANCE WITH TMA USE. SEE PAGE 5		
4 YARD DUMP TRUCK	24,000			60-70		100				
				50-55		75				
				45		50				
2 TON CARGO TRUCK	15,000			60-70		150				
				50-55		100				
				45		75				
1 TON CARGO TRUCK	10,000			60-70		200				
				50-55		150				
				45		100				
ROLL AHEAD STOPPING DISTANCE ASSUMES DRY PAVEMENT										
TMA – RECOMMENDED, SEE TABLE FOR APPLICATION PRIORITIES, PAGE 5-15										

Traffic Space

The traffic space defines **that portion of the roadway in which traffic is routed through the activity area.**

Work Space

The work space is **that portion of the roadway which is closed to traffic** and is set aside for the exclusive use of workers, equipment, and construction materials.

Work spaces may be fixed or moved as work progresses, such as in mobile operations. Long-term work spaces are usually delineated by channelizing devices or shielded by barriers to exclude vehicular traffic and pedestrians.

Lane Encroachment

The following guidance concerning encroachment of the work space into traffic space is found in:

WSDOT's M54-44, Work Zone Traffic Control Guidelines.

- TCP 4, page 19, illustrates that **when establishing a work space on the shoulder of a low speed roadway (35mph or less) a minimum of 10 feet of lane width should be maintained** for vehicle traffic if the work space encroaches into the traffic space.
- TCP 5, page 20, illustrates that **when establishing a work space on the shoulder of a high speed roadway (40mph or higher), if encroachment is necessary the lane adjacent to the shoulder being closed shall be closed and traffic diverted from it's normal path.**

Tangent

The term tangent refers to **the straight away area between the work area and the lane of traffic that runs from the transition taper to the downstream taper.**

Devices are spaced twice the distance of the spacing used in the merging taper (L).

6.6 TERMINATION AREA

The termination area **is used to return traffic to the normal traffic path** and extends from the end of the activity area to the END ROAD WORK sign, if it is posted. It confirms to the driver that the temporary traffic control zone has been terminated. A short downstream taper may be placed in the termination area.

For some operations, **it may not be necessary to install a termination taper or an END ROAD WORK sign if it is obvious to motorists that they have passed through the work area.** For normal daytime maintenance operations and short term utility work the use of an END ROAD WORK sign is optional. Termination tapers may also be impractical where access to the work area is provided in the termination area.

Frequently it is desirable to use tapers in the termination area to clearly indicate to drivers that traffic is being shifted back into its normal path after having been assigned to an - opposing traffic lane around an activity area. In these situations it is advisable to provide a buffer space and adequate transition tapers between opposing traffic streams as illustrated in the MUTCD, Figure 6H-31

Downstream or Termination Taper = 100 feet minimum

A downstream taper may be used at the end of the activity area to inform motorists that they have passed the work site and that access to the original lane or path, which was temporarily closed to traffic, is again available. This taper should have a **minimum length of about 100 feet per lane, with devices spaced at distances of approximately 20 feet.**

Use of downstream tapers is optional, and they may not be practical where access to the work area is provided at the end of the activity area. Movement of work vehicles, personnel, and supplies at the downstream location of the work area may preclude the use of the downstream taper.

6.7 CHANNELIZING DEVICE SPACING

The **maximum space between channelizing devices in a taper in feet normally approximates the posted speed limit in miles per hour** (i.e., a 55 mph speed road should have the devices spaced about 55 feet apart). For short tapers, this spacing may yield too few devices to form a line that is apparent to approaching drivers and the spacing could be decreased. Closer spacing between devices may also be advisable if operational difficulties become apparent. * **WSDOT has adopted closer channelizing device spacing.**

*** WSDOT Channelizing Device Spacing (feet)**

Merging/Shifting/Shoulder tapers

MPH	Taper	Tangent
50/70	40	80
35/45	30	60
25/30	20	40

One-Lane, Two-Way/Flagger taper

Approximately 20 feet

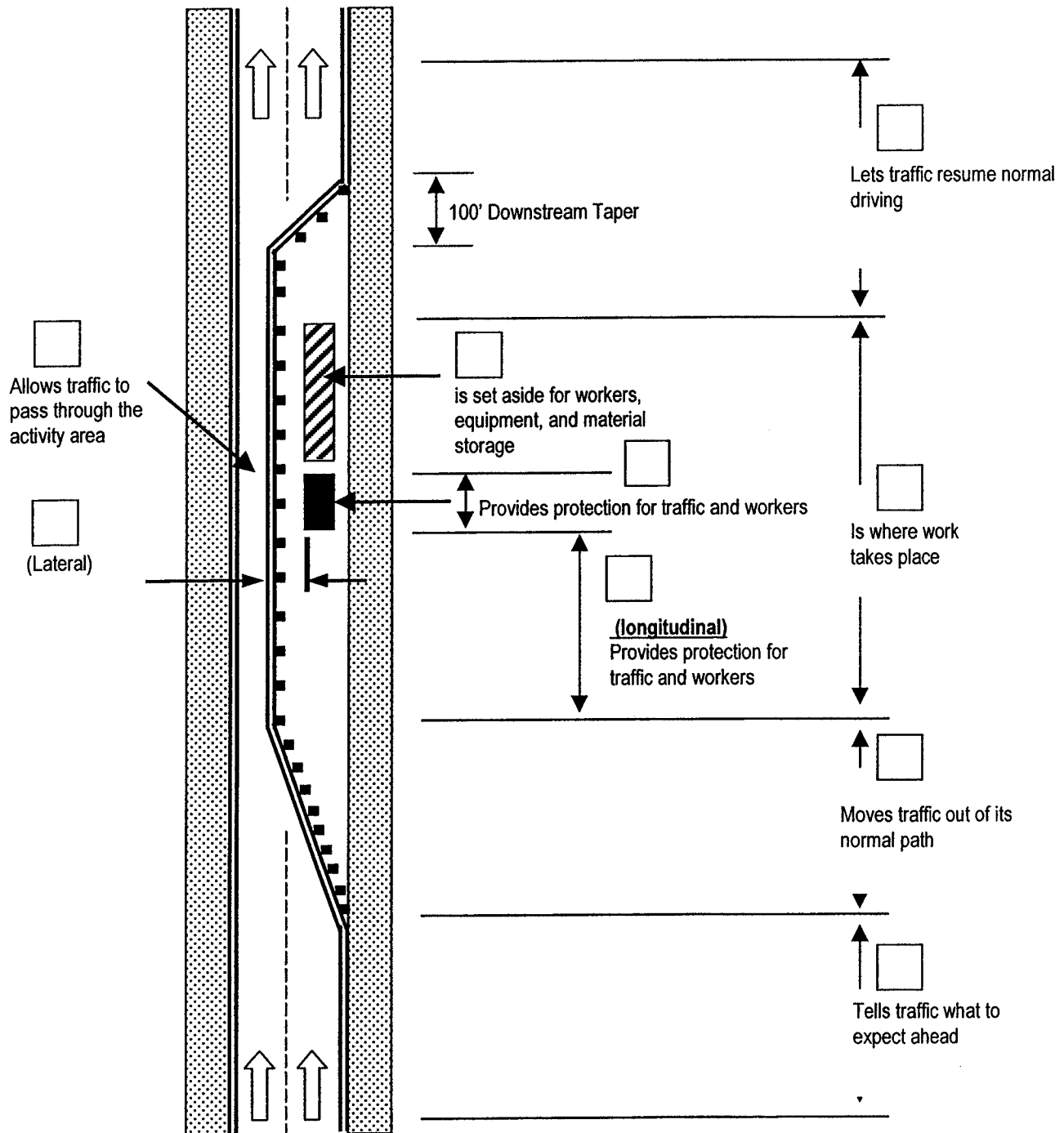
Downstream or Termination taper

Approximately 20 feet

EXERCISE #1 – Traffic Control Plan Element Identification

- A. Advanced Warning Area
- B. Buffer Space
- C. Traffic Space
- D. Termination Area

- E. Transition Area
- F. Activity Area
- G. Work Area
- H. Protection Vehicle



CHAPTER 7

READING CONTRACT PROVISIONS AND TRAFFIC CONTROL PLANS

7.1 SUMMARY

This chapter reviews all relevant temporary traffic control requirements found in a typical “CONTRACT PROVISIONS AND PLANS” document. It also familiarizes students with the locations of Typical Traffic Control Plans. These plans may be used as a resource to assist the TCS during the review and/or development of proposed modifications of Traffic Control Plans.

7.2 CONTRACT PROVISIONS

Standard Specifications for Road, Bridge, and Municipal Construction, M 41-10

These specifications outline and clarify contractor obligations related to road, bridge and municipal construction. Section 1-10 covers temporary traffic control. This section gives a detailed description of the duties and responsibilities of the Traffic Control Supervisor (TCS), the Traffic Control Manager (TCM), and all other traffic control labor.

Amendments to the Standard Specifications

Amendments to the Standard Specifications shall be used in conjunction with the Standard Specifications for Road, Bridge, and Municipal Construction. They are made a part of the contract and supersede any conflicting provisions of the Standard Specifications. The date following each Amendment title indicates the implementation date of the Amendment or the latest date of revision.

Special Provisions

Special Provisions shall be used in conjunction with the Standard Specifications for Road, Bridge, and Municipal Construction.

Special Provisions are made a part of the contract and supersede any conflicting provisions of the Standard Specifications and Amendments to the Standard Specifications.

Several types of Special Provisions may be included in a contract. They are: General, Region, Bridges and Structures, and Project Specific. Special Provisions types are differentiated as follows:

(date)	General Special Provisions
(*****)	Notes a revision to a General Special Provision and also notes a Project Specific Special Provision.
(Regions *date)	Region Special Provisions
(BSP date)	Bridges and Structures Special Provision

General Special Provisions - are commonly applicable statewide.

Region Special Provisions – are commonly applicable within the designated Region. Region designations are as follows:

<u>Regions*</u>	
ER	Eastern Region
NCR	North Central Region
NWR	Northwest Region
OR	Olympic Region
SCR	South Central Region
SWR	Southwest Region
WSF	Washington State Ferries Division

Bridges and Structures Special Provisions – are commonly applicable statewide.

Project Specific Special Provisions – normally appear only in the contract for which they were developed.

7.3 CONTRACT PLANS

Traffic Control Plans

Traffic control plans show the placement and type of all traffic control devices to be used in a work zone and contain information about the type of work zone configuration for each phase or stage of the work.

Traffic Control Plans are provided as part of the contract whenever traffic will be affected by the project. The contractor's responsibilities for implementing the traffic control plan are covered in section 1-10 of the Standard Specifications.

Those sections of the contract plans that apply to temporary traffic control are as follows:

1. Index
2. Vicinity Map/Advance Sign
3. Summary of Quantities
4. Traffic Control Plans
 - a. Site specific
 - b. Typical

Modification of the Traffic Control Plans

WSDOT, Standard Specifications (M41-10)

“The Contractor shall designate and adopt in writing the specific traffic control plan or plans required for their method of performing the work. If the contractor's methods differ from the contract traffic control plan(s), the Contractor shall propose modification of the traffic control plan(s) by showing the necessary construction signs, flaggers, and other traffic control devices required for the project. The Contractor's modified traffic control plan(s) shall be in accordance with the established standards for plan development as shown in the MUTCD, Part VI. The Contractor's letter designating and adopting the specific traffic control plan(s) or any proposed modified plan(s) shall be submitted to the Engineer for approval at least ten calendar days in advance of the time the signs and other traffic control devices will be required. The Contractor shall be solely responsible for providing copies of the approved Traffic Control Plans to The Traffic Control Supervisor.”

“The TCS may make minor revisions to the approved traffic control plan to accommodate site conditions as long as the original intent of the traffic control plan is maintained and the revision has concurrence of the TCM and/or WSDOT TCS.”

7.4 TYPICAL - TRAFFIC CONTROL PLANS

Typical Application diagrams are available for a large variety of temporary traffic control situations. Some of the more common sources are:

- **MUTCD, Manual on Uniform Traffic Control Devices**
- **M54-44, Work Zone Traffic Control Guidelines (WSDOT)**
- **Contract Plans**
- **M21-01, Standard Plans for Road, Bridge, and Municipal Construction (WSDOT)**

While these Typical Application Diagrams cover many traffic control methods and conditions, they do not include a layout for every conceivable work situation. Typical applications should be altered or modified, when necessary, to fit the conditions of a particular temporary traffic control zone. Whenever modifications are deemed necessary and appropriate, the Standards presented in the MUTCD should be given priority over the examples given in typical applications.

Modifications to Typical Applications

The typical application diagrams contained in the MUTCD and various other sources represent procedures for situations which are usually found in the field, but can not reflect all of the conditions encountered during temporary traffic control procedures. Many variables, such as location of work, road type, traffic speed, travel volumes, roadway geometrics, vertical and horizontal alignment, pedestrians and bicyclists, and intersections, affect the needs of each work zone. Because these conditions are found in the field, and since the goal of temporary traffic control is to provide safety with the minimum disruption to traffic, proper judgment must be used in selecting and adapting these typical application diagrams to fit the requirements of each work zone.

Most typical applications are considered minimum requirements. When needed, modifications must be made, and higher type treatments than those shown are often required. The following types of modifications may be desirable and necessary to satisfy the needs found in the field:

- **Additional Devices**
 - Increased number of signs
 - Special signs (PCMS)
 - Arrow displays
 - More channelizing devices at closer spacing
 - Temporary raised pavement markers

- Portable traffic signs
- Portable barriers
- Impact attenuators
- Screens
- Rumble strips
- Intrusion alarms

- Upgrading of Devices
 - Larger signs
 - Brighter retroreflective materials
 - Brighter and/or wider pavement markings
 - Higher type channelizing devices
 - Barriers in place of channelizing devices
 - A full complement of standard pavement markings in areas of high hazard

- Improved Geometrics
 - At detours
 - At crossovers

- Increased Distances
 - Longer advanced warning areas
 - Increased taper length

- Lighting
 - Steady-burn lights for channelization
 - Flashing lights at isolated hazards
 - Illuminated signs
 - Floodlights
 - Temporary roadway lighting

Note

The remainder of this chapter is intended, as a reference, for those who may find it necessary to design a traffic control plan where contract plans are not provided, such as, on a non WSDOT project.

7.5 DESIGNING WORKZONE TRAFFIC CONTROL LAYOUTS

TCP DESIGN CONSIDERATIONS

Design of the TCP requires a thorough understanding of the principles of work zone traffic control and the exercise of good engineering judgement. In order to develop a workable plan, the designer must assemble information on economic and community characteristics of the locality, traffic and transportation characteristics of the facility, seasonal changes and weather patterns, and provisions for worker safety and mobility.

In addition, the proposed work activities must be analyzed to develop TCP's which will satisfy the requirements of different work phases or stages, the complexities of each stage, overlapping of stages, and periods during which construction or maintenance activities will be underway. Areas which must be considered in detail include:

- The location of the work (on the roadway, shoulders, sidewalks, etc.);
- Number of lanes required for the work activity;
- Hours of the day when lanes may be closed;
- Whether work may progress simultaneously in both directions of traffic;
- The length of the work area (for example, controlled staging to permit removal and immediate replacement of safety appurtenances);
- Time of exposure to hazards, such as dropoffs;
- Time involved in curing pavements or bridge decks;
- Hazards created by work activities within the recovery area (storage of construction materials, drainage basins, culvert end sections, pipes, sign supports, or exposed guardrail ends, etc.); and
- Delays incidental to the installation and removal of traffic controls.

While a 24-hour workday may be desirable to accelerate the completion of the work and reduce the number of days during which the area is adversely impacted by the work activity, factors which will affect the design of a TCP which includes nighttime work are:

- Neighborhood objection to noise at night;

- Higher costs for labor and lighting;
- Higher incidence of drivers under the influence of alcohol and drugs at night; and
- Limited availability of services, such as ready-mix concrete and aggregates.

SELECTING TYPICAL APPLICATIONS

The decision concerning which of the typical application diagrams to select as a basis for developing the optimal TCP must consider three factors. These three factors are duration of the work, location of the work and highway type, and are discussed below.

Duration of Work

Five categories of work duration are defined in the MUTCD for temporary traffic control situations. They are:

- **Long-Term Stationary** — Work which occupies a location more than three (3) days.
- **Intermediate-Term Stationary** — Work that occupies a location from overnight to three (3) days.
- **Short-Term Stationary** — Daytime work which occupies a location from 1 to 12 hours.
- **Short Duration** — Work that occupies a location up to one hour.
- **Mobile** — Work which moves intermittently or continuously.

Location of Work

The type of traffic control needed depends upon the location of the work activity in relationship to the moving traffic stream. Generally, the closer the operation is to traffic, the more traffic control devices will be needed. Most frequently, work activities take place on one or more of four locations such as:

- **Outside the Shoulder Edge** — Traffic control may be minimal and consist of a general warning only.

- **On or Near the Shoulder** — Motorists must be warned that work may be in close proximity of moving traffic, and the shoulder may not be available for emergency use.
- **In the Median of a Divided Highway** — Traffic control in both directions may be required and special protection for workers may be necessary.
- **On the Traveled Way** — Optimum protection of workers and maximum advance warning for drivers is essential.

Highway Type

The highway or roadway type is a primary factor in determining the temporary traffic control requirements because of the differences in speeds, volumes, and operating characteristics of the facility. Rural roads often are characterized by relatively low volumes and high speeds and controls may be readily established by using typical layouts with minor modifications. Urban arterials, with high traffic volumes and moderate speeds may require additional controls and revised spacing of devices to accommodate closely spaced intersections and access to businesses and public facilities. Major arterials, freeways, and expressways, because of their high speeds and high volumes, demand the highest type of traffic control and modification of typicals to supplement the recommended array of devices is often necessary.

RURAL TWO-LANE ROADS

WORK OUTSIDE THE SHOULDER

Work activities off the roadway and shoulders but within the right-of-way are usually minimal hazards. Nevertheless, appropriate warning signs should be used if the work activity is likely to affect the road user. The road user needs to be informed of the work activity when any of the following conditions occur:

- Work will be performed very close to the roadway at certain stages of the activity.
- Equipment may be moved along or across the highway.
- Motorists may be distracted by the work activity.

A typical advance warning sign for work within the right-of-way may be ROAD WORK AHEAD. For long work areas, the warning sign should be repeated every two to three miles to remind the motorist that he/she is still in the activity area, and an END ROAD WORK sign should be placed at the end of the traffic control zone.

If the work involves equipment travelling along or crossing the roadway, the equipment should be equipped with appropriate flags, flashing lights, and/or the SLOW MOVING VEHICLE symbol.

MUTCD Figure 6H-1 illustrates a typical layout for stationary work outside the shoulder.

WORK ON THE SHOULDER

When a highway shoulder is closed, the motorist must be advised and the workers must be protected. The design of the temporary traffic control zone differs depending on whether or not the shoulder closure encroaches on the travel lane.

No Encroachment on the Traveled Way

If the shoulder of a two-lane rural road is closed and there is no encroachment on the travel lane, then there is no interference with traffic. Usually, the placement of the single warning sign SHOULDER WORK is adequate.

MUTCD Figure 6H-3 shows the traffic control layout for work on the shoulder of a two-lane road with intersections near the work space.

Minor Encroachment on the Traveled Way

When work is on the shoulder or takes up part of a traffic lane, traffic volumes, vehicle mix, speed, and capacity should be analyzed to determine if the affected lane should be closed. The lane encroachment should permit a remaining lane width of 10 feet, or the lane should be closed. In the case of the two-lane rural road a 9-foot lane width is acceptable if the volumes and speeds are low and if the traffic mix does not include large, wide, heavy commercial vehicles (otherwise use 10 feet as the minimum design criterion for the remaining lane width).

MUTCD Figure 6H-6 shows a typical traffic control plan where the work area encroaches slightly into the travel lane.

LANE CLOSURE

When one lane of a two-lane, two-way highway must be closed, the remaining lane must be controlled so that it can accommodate traffic in both directions. Control is provided by flagging or other means to allow alternating traffic on the unobstructed open lane.

Alternate one-way traffic control may be effected by the following means:

- Two flaggers, one at each end of the worksite.
- One flagger, who assigns right-of-way in both directions (short worksite with low traffic volumes and low speeds).
- Traffic may be self-regulating at very short worksites; however, this method is not satisfactory when the work area is near sharp hills and curves.
- Use of a pilot car or pilot cars.
- Temporary traffic signals (long-duration projects).

Flagger Control

The typical procedure for short-term work is to utilize flaggers to alternate traffic flow. MUTCD, Figure 6H-10 shows the typical layout for a flagging operation.

Traffic approaching the lane closure faces advance warning signs of ROAD WORK XXX FEET and ONE LANE ROAD XXX FEET and finally the advance FLAGGER symbol sign. The advance flagger sign is to be located 500 feet in advance of the flagger station. This sign must be covered or removed when the flagger is not at this station.

For low-volume situations involving short work zones on straight sections of road, a single flagger may be adequate. The flagger assigns right-of-way for both approaches to the activity area and must be visible to traffic in both directions.

When the temporary lane closure is obscured from view beyond a horizontal curve or over a hillcrest, the work zone should be extended upstream so that the taper is placed in full view of approaching traffic, and flaggers should be stationed at each end of the work area.

Flagging will be discussed in more detail in Chapter 9.

Sign-Only/Self-Regulating Control

For low traffic volumes on a minor road, where traffic may be self-regulating, there are instances where the flaggers may be eliminated. In order to eliminate flagger control, both of the following conditions must exist:

- Traffic volumes are low enough to provide sufficient gaps for the traffic that must yield; and
- Drivers from both directions must be able to see approaching traffic through and beyond the worksite.

If the above two conditions exist on a low-volume two-lane rural road, the application shown in the MUTCD, Figure 6H-11 may be used. Essentially, YIELD signs replace the flaggers and the YIELD AHEAD sign serves the same purpose as the advance FLAGGER sign.

If a night closure is necessary, Type A flashing warning lights, or Type B high-intensity flashing warning lights may be placed on the ROAD WORK AHEAD and the ONE LANE ROAD AHEAD signs.

Temporary Traffic Signals

MUTCD, Figure 6H-12 illustrates the layout for a long-term lane closure on a two-lane highway which would require flagging at night. The temporary traffic signal takes the place of the flagger as described above.

The maximum length of the activity area for one-way traffic signal control depends on the level of peak hour traffic demand, and for practical purposes should be limited to 400 feet.

If the temporary signal is operated in the flashing mode (either manually or automatically), a red indication shall be flashed to both approaches.

HAUL ROAD CROSSING

When a construction access road or haul road is carried across the highway, flagging or temporary traffic signals, with appropriate advance warning signs will be required.

MUTCD, Figure 6H-14 shows typical layouts for a haul road crossings. The illustration illustrates layouts for both flagging and temporary traffic signal control.

Flagging Control

For short-term operations in the daylight, a haul road crossing requires a ROAD WORK AHEAD, DO NOT PASS, and ADVANCE FLAGGER symbol sign. When the haul road is closed, the haul road should be barricaded, the highway pavement cleaned, and the signs removed.

Haul road crossings open at night should be supplemented with floodlights.

Signal Control

When the haul road is controlled by temporary traffic signals, two sets of signals are used - one set facing each direction of traffic. The signals shall have push button activation and shall meet the display and operational requirements of Part IV of the MUTCD.

WORK IN CENTER OF ROAD

If a low-volume, two-lane roadway is wide enough to permit work in the center of the street and still allow at least one 10-foot lane in each direction (measured from the edge of the channelizing devices to the edge of pavement), then the work zone can be established and the roadway left open to two-way traffic. If sufficient width is not available to provide 10-foot lanes, the work may have to be accomplished on one side of the centerline at a time so that traffic can be accommodated on the remaining lane. Another option would be to close the road to through traffic and establish a detour (MUTCD, Figures 6H-8 and 6H-9).

MUTCD Figure 6H-15 shows a traffic control plan for a work area in the center of a two-lane roadway and the recommended deployment of traffic control devices for this situation. Lane transitions can be accomplished with channelizing devices or with a work vehicle displaying a flashing or revolving yellow light.

SURVEYING ALONG CENTERLINE OF A LOW VOLUME ROAD

When it is necessary to have survey crews operate along the centerline of a low-volume, two-way rural road, it is necessary to provide traffic control devices to protect the workers. MUTCD Figure 6H-16 shows the layout for this situation. The advance warning series includes a SURVEY CREW AHEAD or ROAD WORK AHEAD sign and the FLAGGER symbol sign. Cones should be placed 6 to 12 inches on either side of the centerline at each flagger and survey crew location. Within the survey zone and between the advance FLAGGER signs, cones should be placed along the centerline at a maximum spacing of 100 feet.

A flagger should be used to protect people who must work with their backs to traffic. Workers in the roadway should wear high-visibility clothing.

If surveying is accomplished along a high-volume road, one lane should be closed as shown in the MUTCD Figure 6H-10.

It should be emphasized that the same treatment is required in both directions.

ROAD CLOSURES, DIVERSIONS AND DETOURS

Typical layouts for road closures which require diversions or detours are shown in the MUTCD Figures 6H-7, 6H-8, and 6H-9.

Diversions

MUTCD Figure 6H-7 shows the proper layout for a situation where the roadway has been closed and a bypass constructed around the closed section. Signs, channelizing devices and pavement markings are used to indicate the transition to the temporary roadway. Note that the signs shown in Figure 6H-7 are for one direction of traffic only and must be repeated for the opposite approach.

Detours

MUTCD Figures 6H-8 and 6H-9 show the signs and devices needed for a detour. Detour signing is usually done by the traffic engineer who has the authority over the roadway because it is considered a traffic routing problem.

Detour signs are used to direct traffic onto another roadway, through the detour area, and then back to their original route (MUTCD Figure 6H-9). Detour signing should warn road users in advance of the closure so that routing decisions can be made. If the detour is long, signs should be installed periodically to remind and reassure the drivers that they are still on the detour. The appropriate signs for these reminders are the DETOUR MARKER or the DETOUR signs.

If portions of the detour are kept open to local traffic, the ROAD CLOSED TO THRU TRAFFIC sign should be used and the portion of the road open to local traffic should have adequate signing, marking, and protection.

URBAN STREETS AND INTERSECTIONS

Urban temporary traffic control zones present special problems because users other than highway vehicles must be considered. Provisions must be made to

accommodate pedestrians and bicyclists, and disruptions to transit operations must be minimized. It is often necessary to divide the control zone into segments and to schedule work only during off-peak hours. Decisions have to be made as to how to control vehicular traffic, the number of lanes which may be closed at various times of the day, and whether turning movements must be prohibited at intersections. Access to businesses, industrial facilities, and residences must often be maintained even if the roadway is closed to vehicular traffic.

WORK IN VICINITY OF INTERSECTION

Midblock lane closures, or those for work at the near side of an intersection, should be accomplished in the usual manner with appropriate advance warning signs and transition tapers (MUTCD Figure 6H-21). Sign spacings and the number of advance warning signs may have to be reduced to accommodate closely spaced intersections, driveways, bus stops and other constraints. A significant problem which may occur with a near side lane closure is a reduction of capacity which may result in congestion and backups. At signalized intersections, adjustment to traffic signal timing and phasing may be necessary to alleviate these problems.

WORK ON FAR SIDE OF INTERSECTION

Work activities on the far side of an intersection require special treatment to handle through as well as turning movements. Since merging movements within the intersection should be avoided, the applicable principle is to close the appropriate lane or lanes which do not carry through the intersection at the near side intersection approach (MUTCD Figures 6H-22 through 6H-25). Turning restrictions may have to be imposed or exclusive turn lanes may have to be provided.

WORK WITHIN THE INTERSECTION

Whenever work activities occupy space within the intersection, traffic must be channelized into the proper lanes at the near side approaches to all legs of the intersection. Consideration should also be given to using uniformed police personnel for directing traffic at these locations (MUTCD Figures 6H-26 and 6H-27).

DETOURS

When the entire road or street must be closed temporarily, a detour should be provided and traffic warned of the closure in advance. In addition to providing adequate signing, channelization, and marking at the point of the road closure, detour signing should be installed along the entire detour route so that traffic will be able to get through the area and return to the original roadway beyond the temporary traffic control zone. In urban areas, it may be necessary to supplement the DETOUR signs with a street name sign to advise the motorist of the name of the street being detoured. Part VI of the MUTCD Figure 6H-9 illustrates typical detour signing in an urban street network.

Since detour routing often affects roadways other than those under construction, it is considered a traffic routing problem and should be handled by the traffic engineer with authority over the roadways being impacted. Therefore, coordination and cooperation with the appropriate highway authorities is essential.

PEDESTRIAN AND TRANSIT CONSIDERATIONS

MUTCD Figures 6H-28 and 6HA-29 illustrate typical treatments for pedestrians in temporary traffic control zones. Where transit routes serve the area and where pedestrian access is restricted, provisions must be made for relocating bus stops or transfer points, and for providing pullouts and waiting areas for transit patrons. Advance information concerning such temporary changes to transit facilities should be part of the implementation plan.

MULTILANE UNDIVIDED ROADS

Typical layouts for multilane roadways are discussed in Section 6G-11 of the MUTCD. Applications include right lane closures, left lane closures, multiple-lane closures, and closures on five-lane roadways. The following paragraphs discuss the application of those typicals to the closure of interior (i.e., left) lanes, multiple lanes, and half-road closures.

CLOSURE OF INTERIOR LANES

If the work activity can be contained entirely within the left (or interior) lane of a multilane roadway, it may be appropriate to close only that lane. Impacts on traffic capacity will decrease if fewer travel lanes are actually closed to traffic. Under this scenario, channelizing devices are placed along the centerline and the outside of the work activity to give advanced warning to the opposing traffic. If the

northbound left lane of four-lane road were closed to accommodate the work zone, for example, the ROAD WORK AHEAD and the LANE DROP symbol sign (W; 2) would be spaced as shown in Part VI of the MUTCD Figure 6H-30. The lane closure would be accomplished with channeling devices using a taper length calculated as described in Chapter 6. In the southbound direction, a ROAD WORK AHEAD sign would be placed and cones would be placed along the centerline through the entire work zone.

MUTCD Figure 6H-30 shows how the transition tapers would be set up if the decision was made to close both interior lanes of a multilane roadway. Although not specifically shown in Figure 6H-30, appropriate longitudinal buffer spaces should be provided for each direction of travel between the transition area and the space which is occupied by workers or work vehicles. This layout provides additional protection for the workers and easier access to the work space.

The decision to close the interior lane in one or both directions should be made based on overall traffic and worker safety taking into account existing traffic volumes and speeds in each direction.

CLOSURE OF MULTIPLE LANES

When the work activity occupies more than one lane of a multiple lane roadway, choices can be made about the lane distribution that remains open to traffic. A capacity analysis should be conducted to determine if better traffic capacity balance might be achieved with an unbalanced flow or if the number of lanes remaining open to traffic during the work activity should be equal in each direction.

Lane Closures with Unbalanced Flows

MUTCD Figure 6H-31 shows the typical layout for a work zone on a four lane street with unbalanced traffic flows. Lane transitions are made such that two northbound lanes are still available to traffic even though the work area is located in one of the existing northbound lanes. This is accomplished by transitioning one northbound travel lane into an existing southbound lane resulting in one closed lane, two northbound, lanes and one southbound lane.

MUTCD Figure 6H-31 shows a buffer space in both directions — one to protect the workers in the work area and one to separate opposing directions of traffic. Conflicting pavement markings should be removed for long-term projects. Interim markings should be installed where needed.

Half Road Closures

When the work area takes up multiple lanes, the number of lanes open to traffic may be reduced to one in each direction. Part VI of the MUTCD Figure 6H-32 shows the proper layout used when a four-lane road is reduced to one lane in each direction. In long-term operations, the pavement markings should be removed or obliterated and interim markings used as necessary.

Note that the lane transitions on a high speed roadway are made in sequential steps. A taper is provided to reduce two northbound lanes to one lane and then a single lane is provided for at least a distance of $1/2 L$ (where the length "L" is determined by the width of the initial offset and the speed limit of the road). Only after this tangent section of single lane is the second taper introduced to transition the single lane to the new location.

For intermediate-term situations, it may not be feasible to remove and restore pavement markings. In these situations the channelization must be emphasized by using a very close device spacing. In locations where traffic moves in conflict with remaining pavement markings (e.g., traffic diverted over a double yellow centerline), channelizing device spacing of 10 feet is recommended.

FREEWAYS AND EXPRESSWAYS

Freeways and expressways are characterized by high speeds or high volumes of traffic, or both. They usually are access-controlled highways, but access control on expressways may be only partial. The density of traffic on these facilities requires the most careful temporary traffic control procedures, and more conspicuous and supplementary control devices are often needed to adequately protect work crews and motorists. However, the same important basic considerations of uniformity and standardization of general principles apply to these highways as to other roads and streets.

WORK BEYOND SHOULDERS

Motorists should be warned of work activities which may interfere with traffic movement either directly or by attracting attention due to their presence. If the work space is less than 15 feet from the edge of the roadway, a ROAD WORK AHEAD sign should be used in advance of the operation. If the activity area extends for several miles, the sign should be repeated at least every two miles to remind the motorist that he is still within the limits of the worksite. An optional END ROAD WORK sign may be installed to advise the driver that the activity area has ended.

WORK ON THE SHOULDER

Work on shoulders of high-speed highways requires a closure of a portion of the roadway which the driver expects to use in case of emergency. Adequate advance warning signs should be used to indicate the shoulder closure, and the activity area should be defined with channelizing devices preceded by a transition taper. MUTCD Figure 6H-5 shows the typical temporary traffic control for a shoulder closure where positive protection is provided for the work force. Use of barriers is optional, but may be appropriate for intermediate and long-duration operations, especially in high traffic volume situations. If an arrow display is used to supplement the required traffic control devices in conjunction with a shoulder closure, the display shall be operated in the caution mode.

When work on the shoulder of a high-speed, high-volume facility encroaches upon a through traffic lane, consideration should be given to closing the adjacent traffic lane. An analysis of the impact on the capacity of the facility must be made to determine the feasibility of the required lane closure.

The length of the transition taper for a shoulder closure should be a minimum of $\frac{1}{3} L$ with the width of the shoulder being used in the taper length formula. If the shoulder in advance of the closed section is used as a temporary through traffic lane, the shoulder closure should be treated as a lane closure and a full transition taper length provided.

SINGLE LANE CLOSURE ON A DIVIDED HIGHWAY

MUTCD Figures 6H-33 and 6H-34 show single lane closures without and with barriers respectively. The basic traffic control layout is the same whether the lane closure is for the right or the left lane of a divided highway, with appropriate message changes on the advance warning signs. Spacing of signs can be increased, and additional signs provided if field conditions require modification of the typical application diagrams illustrated. Taper lengths should also be adjusted to reflect operating conditions and to correct problems in the transition area.

When a barrier is introduced to provide positive protection of the work space, the lane shall first be closed using channelizing devices and pavement markings (MUTCD Figure 6H-34). The barrier is placed on a flare beginning beyond the downstream end of the merging taper and should be treated to prevent vehicles from impacting the ends of the barrier. Guidelines for treating barrier ends are given in Chapter 9 of the AASHTO Roadside Design Guide.

DOUBLE LANE CLOSURE ON A FREEWAY

Adjacent lanes of a multiple-lane, one-way roadway may be closed by using two separate tapers, one for each lane closure. These tapers should be spaced at least twice the distance of the required taper length span ($2L$) to permit traffic to become stabilized after the first merging maneuver and before the second merge is required (MUTCD Figure 6H-37). The minimum length of the entire transition area thus becomes four times the taper length ($4L$). A careful analysis of roadway capacity should be made before this type of closure is attempted. Also, multilane closures are usually feasible only during off-peak traffic periods.

The preferred positions for the arrow displays for this situation are at the beginning of each transition taper. However, the arrow display may be placed in the second closed lane at the beginning of the work space if the display is mounted on the protection vehicle or if the alignment or other conditions create confusion as to which lane is closed by the second arrow display. It may also be placed in the second lane if the arrow display for the closed exterior lane must be located at the end of the first merging taper, for example in the case of narrow or nonexistent shoulders.

CENTER LANE CLOSURE

To close the center lane of a three-lane, one-way roadway, traffic must first be transitioned out of the right or left lane into the center lane, and then diverted around the activity area with the use of a shifting taper. Only one arrow display for the initial lane transition should be used for this type of center lane closure.

If off-peak traffic volumes can be accommodated in a single lane, the double lane closure technique should be employed to close the center lane because it provides for safer operation of the work activity and permits access to the work space by supply vehicles and work crews with minimal interference with through traffic.

LANE SHIFT

A lane shift should be used when work space extends into the right or left lane of a divided highway and when it is not practicable, for capacity reasons, to reduce the number of available lanes. A shoulder of sufficient widths must be available to accommodate the lane shift, or temporary widening of the roadway must be feasible. The minimum width of the shoulder should be 10 feet.

MUTCD Figure 6H-36 illustrates a lane shift on a freeway. Existing conflicting pavement markings must be removed and appropriate temporary markings should be installed. When the lane shift is limited to daylight hours, lanes may be delineated by channelizing devices in lieu of temporary markings. The optional special REVERSE CURVE signs may be used to indicate the initial shift as well as the return to the original alignment. Arrow displays shall not be used on multilane roadways to laterally shift all lanes of traffic, because unnecessary lane changing may result.

TWO-LANE, TWO-WAY OPERATION

Two-lane, two-way operations (TLTWO) on one lane of a normally divided highway requires special consideration during the planning, design, and construction phases. Because it has unique operational problems (for example, the risk of serious head-on collisions is increased) a number of factors should be considered during the decision making process concerning the application of this mode of temporary traffic control. The factors are as follows:

- Is a suitable alternate route available to serve as a detour?
- What are the traffic characteristics?
- Can traffic be maintained on the shoulder, making TLTWO unnecessary?
- Could temporary lanes be constructed in the median?
- Can the work be accomplished by closing only one lane in a given direction and what would be the additional hazard to construction workers if this option is selected?
- Will TLTWO result in shortened construction time?
- Will TLTWO allow the contractor to perform the work more efficiently and possibly result in decreased construction costs?
- What has been the past experience with this type of operation? Is the “track record” good?
- Are there any width or height restrictions which would preclude TLTWO (for example, bridges and overpasses) or the use of a shoulder or the median as a temporary lane?

- What is the condition of the pavement and the shoulders in the proposed TLTWO section? Due to width restrictions, traffic may have to drive on the shoulder which must be structurally adequate.
- Is the median shoulder adequate to permit emergency stopping?

MUTCD Figure 6H-39 shows the recommended traffic control plan for a TLTWO on a normally divided highway. The plan illustrates the proper treatment of the approach to the TLTWO section, the signing and channelization of the median crossover, and the requirement for positive separation throughout the two-way segment. Treatments for entrance and exit ramps within the two-way roadway portion for this type of operation are shown in MUTCD Figures 6H-40 and 6H-41.

Crossovers for TLTWO

The temporary roadways which lead from the closed roadway into the two-way operation and back to the original divided highway are called TLTWO crossovers. Guiding principles for the design of these crossovers are as follows:

- Crossovers should be designed for operating speeds not less than 10 miles per hour below the posted speed limit, the off-peak 85th percentile speed prior to the start of the work, or the anticipated speed of the roadway, unless unusual site conditions require that a lower design speed be used.
- Tapers for lane drops should not be contiguous with the crossovers.
- Flat, diagonal crossovers are better than reverse curves with super elevation.
- The design of crossovers should accommodate all roadway traffic, including trucks and buses.
- A good array of channelizing devices and properly placed pavement markings are essential in providing good positive guidance to motorists.
- Portable barriers and the excessive use of traffic control devices can not compensate for poor geometric design of crossovers.
- A clear roadside recovery area should be provided adjacent to the crossover.

Separation Devices for TLTWO

Throughout the two-way portion of the roadway in a TLTWO, opposing traffic must be separated with positive separation devices. The use of striping, raised pavement markers, and complementary signing, either alone or in combination, is not considered acceptable for separation purposes. Design and performance characteristics of separation devices suitable for TLTWO include:

- **Portable Concrete Barriers** — Provide the greatest protection from potential head-on collisions and are the preferred treatment for TLTWO applications, especially for short segments. However, they are often the most costly treatment.
- **Temporary Raised Islands** — Usually constructed with bituminous materials, are less expensive than concrete barriers. They should be supplemented with other channelizing devices, typically with tubular markers, and should not be used where speeds are expected to exceed 45 mph.
- **Drainage and Snow Removal** — Must be considered when concrete barriers or temporary raised islands are used.
- **Drums** — Effective separation devices but can be hazardous if hit by passing vehicles.
- **Barricades** — Suitable for separating opposing traffic streams but susceptible to being blown over or displaced by large vehicles passing close to them.
- **Vertical Panels** — Readily seen due to their height and do not require much road space. They can be mounted semi-permanently on lightweight posts driven into the pavement or set into holes drilled in the pavement. The latter application can be used if the TLTWO is in effect during certain hours of the day only.
- **Tubular Markers** — The narrowest devices and can be epoxied or bolted to the pavement or set into holes drilled in the pavement. Self-restoring bases are available for these markers which will withstand periodic impacts from passing vehicles. However, the effectiveness of their ability to return to their original position varies widely with different manufacturers.
- **Opposing Traffic Lane Dividers** — New devices manufactured out of lightweight materials and potentially very effective for use in TLTWOs. Experience with these devices is limited at this time.

- **Cones** — Have the advantage of being easy to place and remove and their purchase price is relatively low.
- **Cones and Tubular Markers** — Readily displaced or damaged by passing vehicles and subject to intentional abuse by motorists. Continual maintenance of these devices is required if they are to maintain their effectiveness.

Repositioning or replacement of all separation devices will require varying degrees of maintenance and the costs associated with this work can be substantial. Also, this type of maintenance activity entails considerable risk to the workers involved.

INTERCHANGES

On freeways and expressways with interchange ramps, access should be maintained even if the work space is in the lane adjacent to the ramps. If access can not be maintained, ramps should be temporarily closed by using signs and Type III barricades. If an exit is closed, advance information should be provided to the motorist. An effective method of accomplishing this is to place a black-on-orange plate containing the message EXIT CLOSED diagonally across the interchange guide signs. Early coordination with officials having jurisdiction over the affected cross streets is needed prior to ramp closures since these actions may have a major impact on nearby businesses and traffic generators.

MUTCD Figures 6H-42 and 6H-43 illustrate temporary traffic controls for work sites in the vicinity or on exit ramps, and Figure 6H-44 shows the recommended treatments for entrance ramps. Egress to exit ramps should be clearly marked and outlined with channelizing devices and an optional sign provided to indicate that the exit remains open. The temporary exit sign, mounted in the temporary gore, must be clearly visible to approaching traffic. This sign must be mounted high enough so that it can be seen over the channelizing devices, and in no case shall there be less than 3 feet from the pavement surface to the bottom of the sign. The spacing of channelizing devices should be carefully adjusted to clearly indicate the point of departure of the exit ramp from the through traffic lanes.

When a work space interferes with an entrance ramp, a lane on the freeway may need to be closed sufficiently far in advance of the entry point to stabilize traffic flow before reaching the merge area. As the work space in the ramp area changes, ramp traffic may require shifting as indicated in the MUTCD Figure 6H-44.

SHORT DURATION WORK

Short duration work (i.e., work operations taking less than 60 minutes) generally involved different treatments than described earlier in this chapter because often times it would take longer to set up and remove the traffic control zone than it would to perform the work. Therefore, in order to reduce the hazards to the crew involving setting up and taking down the traffic control zone and in order to reduce the impact on traffic, short duration activities are controlled by a somewhat simpler strategy.

In a short duration work operation, the numerous small traffic control devices are replaced by fewer but more dominant, effective devices. More mobile devices (e.g., signs mounted on work trucks) and larger, more visible, and more imposing devices are used. For example, appropriately colored and marked vehicles with flashing or rotating lights, perhaps augmented with signs or arrow displays, may be used in place of signs and channelization devices shown on the Typical Application diagrams for intermediate and long-term operations. It is important to note that this “simpler” strategy does not compromise the safety of the worker or the road user. It simply replaces one type of traffic control device (smaller, more numerous signs and channelizing devices) with larger, more dominant, but less frequent devices (signs, lights, and arrow displays mounted on work vehicles).

SHORT-DURATION WORK BEYOND THE SHOULDER

MUTCD Figure 6H-1 shows the layout for intermediate and long term work beyond the shoulder. In a short-duration work situation, the signs and any channelizing devices may be eliminated if a vehicle with an activated flashing or revolving yellow light is used.

SHORT-DURATION WORK ON THE SHOULDER

Similar to the situation above, short-duration work done on the shoulder can be protected with a vehicle with an activated or flashing yellow light instead of with signs and channelizing devices. MUTCD Figures 6H-3 and 6H-6 both show situations where the vehicle may be used in lieu of the signs and channelizing devices.

SHORT-DURATION WORK IN INTERSECTIONS

MUTCD Figure 6H-25 shows a layout for work done in the center of an intersection. In this application, the channelizing devices may be eliminated if a flashing or revolving yellow light is displayed in the work space.

SHORT-DURATION WORK SUMMARY

Whether the short-duration work takes place on or off the shoulder, in the traffic lane, or at an intersection, the primary purpose of the work zone layout remains the safety of the worker and the road user. The typical applications for short duration work give the designer the option of using larger, more dominant devices (e.g., work vehicles equipped with flashing or revolving yellow lights, arrow displays, or changeable message signs) instead of the pattern of signs and channelizing devices used in intermediate and long term operations.

LAW ENFORCEMENT PERSONNEL

The responsibility for developing, installing, and maintaining temporary traffic controls at, and in the vicinity of, work sites generally rests with the highway agency and the contractor performing the work. However, conditions may occur which require additional traffic control methods and procedures that can only be provided by law enforcement agencies through increased enforcement activities or the deployment of uniformed police officers. Experience has shown that in those instances where highway work disrupts normal traffic operations, safety benefits are derived when law enforcement agencies become an integral part of project traffic management and take an active role in the implementation of the traffic control plan.

Planning and Coordination

The important role of law enforcement officials in temporary traffic control should be recognized early in project development by bringing them on board as soon as possible. Coordination with the enforcement agencies will improve the relationship between them and the highway work forces, and will assure cooperation throughout the life of the project. These contacts are also vital for establishing channels of communication among the parties involved in managing traffic control through work zones, and help define the lines of authority and responsibility in case of emergencies.

During the process of developing the TCP for work operations, the needs and requirements of law enforcement agencies should be considered. Typically, this

would include special provisions to aid police in performing their enforcement duties, such as sites for pulling vehicles off the travel lanes to issue speeding citations or to perform size, weight, and height checks on suspect vehicles. To aid police in speed limit enforcement, the traffic control scheme should also provide for strategically located stations for radar units and patrol vehicles.

In those instances where police officers are to be employed for temporary traffic control in an off-duty capacity, adequate procedures for obtaining their services must be developed.

Role of Enforcement Personnel in Temporary Traffic Control

Deployment of law enforcement personnel in work zones has been most beneficial under the following conditions:

- To provide added protection for work crews during the installation and removal of traffic control devices in the temporary traffic control zone. Strategic positioning of police cruisers equipped with flashing lights increases the conspicuity of the operation and the vehicles can be used to temporarily block traffic lanes to ease the placement of devices. The presence of police officers also tends to reduce travel speeds on the highway section.
- To enforce compliance with reduced statutory speed limits through the work zone. Field studies have demonstrated that speed reductions of 6 to 8 mph can be achieved if police officers are visible to motorists and enforcement actions represent a real threat to violators. The combination of a police vehicle with flashing lights stationed at the beginning of the transition area, and an officer motioning motorists to slow down, has been the most effective technique for achieving speed reductions.
- To manually control traffic movements through intersections in work zones.
- To enforce truck weight, width, and height limits and to enforce parking regulations.
- To assist in operations which involve nighttime traffic control.

While direct involvement of enforcement agencies in project activities may be desirable, higher priorities may preclude the availability of police officers for work site traffic control. However, enforcement personnel have important responsibilities for traffic management in emergency situations, and they can be of

assistance in inspecting and maintaining the viability of the TCP throughout the duration of the work.

Management of an accident scene is normally a police function as are accident investigation and reporting. Arrangements between the highway agency and the police should include provisions for the timely notification of all parties if accidents or incidents occur within the temporary traffic control zone, and for the exchange of relevant documentation concerning these events. Additional details on accident investigation and reporting are covered in Chapter 15.

EMERGENCY SITUATIONS

Emergency situations can occur on highways at any time and at any location, and can disrupt the efficient operation of the site. Frequently, these unexpected events reduce the capacity of a roadway section to some degree unless steps have been taken in advance to minimize or mitigate the potentially disruptive impacts of such occurrences. While procedures for managing emergency situations should be considered for all temporary traffic control zones, careful planning is especially critical for longer duration work activities on multi-lane highways which carry high volumes of traffic.

Emergencies due to accidents, mechanical failure and breakdown of vehicles, cargo spills, inclement weather, and other events can reduce the capacity of a highway section from 20 to 80 percent, depending on the type of the event and its location. Experience also indicates that any type of incident sharply increases the potential for accidents. Studies have shown that secondary accidents account for better than 13 percent of all accidents on highways and that approximately 20 to 30 percent of all pedestrian fatalities on freeways can be attributed to some type of emergency situation.

In work zones, the management of emergencies is even more difficult due to the presence of unexpected conditions on or along the roadway and because of the work activity itself. Reduction or narrowing of travel lanes, shoulder closures, the need for protective barriers at work sites, and distractions created by equipment and workers on or adjacent to the highway all make it more difficult to maintain access to the locations of accidents and incidence. Similarly, these conditions interfere with the efficient removal of disabled vehicles and injured persons. Careful advance planning, and the development of effective procedures in cooperation with other emergency management personnel and agencies are necessary to minimize or mitigate the potentially disruptive effects of incidents and accidents at work sites.

Emergency Management Procedures

Effective emergency management procedures generally include the following five elements:

- Detection and Verification;
- Response;
- Removal; and
- Motorist Information.

Detection and Verification

On small and short term projects, project personnel can usually be relied on to detect emergencies and to report incidents to the proper authorities. Arrangements can also be made with local enforcement officials to increase the frequency of police patrols through the temporary traffic control zone. Electronic surveillance systems have been used successfully on very complex urban projects to detect and verify emergency conditions.

Response

Early and effective response is critically important in emergency situations.

Plans to deal with emergencies should be developed prior to the establishment of the temporary traffic control zone in cooperation with appropriate emergency response agencies. At a minimum, local highway agencies, the police, fire department, and ambulance services should be contacted and advised of the planned work activities. Where the potential for hazardous material spills exist, appropriate response teams should be alerted and consulted.

The level of detail of the response plan will be a function of the nature and complexity of the work and the disruption of traffic service which can be anticipated in emergencies.

Removal

Removal of disabled vehicles, injured people, or other obstructions from the roadway should be expedited as much as possible to restore the capacity of the roadway. Field studies have shown that each minute of incident duration causes four to five minutes of delay during off-peak hours and up to eight minutes of delay during peak-hour flows. However, in some instances it may be better to

defer the removal of disabled vehicles if removal operations are more disruptive than the incident itself. Judgement is required to determine the best course of action in these situations.

When planning for emergencies during development of traffic control plans, provisions can be incorporated into the TCP which will aid in the removal of damaged or disabled vehicles from the traffic lanes and facilitate the investigation phase of the incident. Widened shoulders and pull-offs have been used successfully on high speed, high volume urban highway sections to temporarily store disabled vehicles in case of emergencies. Contractor furnished service vehicles or tow-trucks can be stationed at strategic locations within the work zone to expedite the removal of stranded or damaged vehicles.

Motorist Information

The notification of motorists concerning traffic conditions ahead and the appropriate course of action to be taken is the last element of an effective emergency management process. The objective of this phase is to provide information to motorists which will reduce their level of frustration with roadway conditions and to reduce traffic hazards in the proximity of accident or incident locations. By providing relevant information to drivers, vehicle operating speeds can be reduced and, occasionally, traffic volumes passing the site of the temporary disruption can be reduced.

The most frequently employed technique for communicating emergency information to motorists is through the use of signing. Warning signs on temporary supports are the simplest method to furnish information to drivers, but the technique has severe limitations. Changeable message signs are much more effective for advising motorists of the conditions ahead, and they offer the flexibility to display precise instructions concerning the best course of action.

SUMMARY

The detailed design of plans for temporary traffic control zones builds upon the product of traffic and transportation planning process which generates the basic strategies for controlling traffic in conjunction with highway construction and maintenance activities. During the detailed design of the TCP, the control strategy is revised and fine tuned to reflect impacts which may not be apparent in the early stages of the proposed project.

Traffic Control Plans can range in complexity from specific plans for each construction stage and phase for a given project to being a mere reference to the

application diagrams shown in the MUTCD, to standard designs developed by state and local highway agencies, or utility company drawings.

The design of TCPs requires a thorough understanding of work zone traffic control principles and the exercise of good engineering judgement. The plan must be responsive to the economic and community characteristics of the area, must consider traffic and transportation patterns of the facility, accommodate seasonal changes and weather patterns, and provide for the safety of workers and highway users.

Typical application diagrams contained in the MUTCD provide a good starting point for the development of the final TCP. However, since it is very rare that the actual project location and site conditions exactly duplicate the conditions illustrated in the typical application examples shown in the manual, appropriate modifications must be made to these typicals. It must also be kept in mind that the applications shown represent minimum requirements, and additional and upgraded devices may be needed for a given situation.

The requirements for the design of TCPs for the most frequently encountered temporary traffic control situations have been presented, and the use of typical plans and their modifications for rural two-lane roads, urban streets and intersections, multilane undivided roads, and freeways and expressways were illustrated. Short duration work was discussed, including acceptable modification of standard traffic control layouts to reflect the short term nature of these types of operations.

Workshop # 1 – Reading Traffic Control Plans

You and your co-worker are TCS's for the WSDOT Project on SR 512 from MP 8.76 to MP 12.06 in the vicinity of South Hill and the SR 167 Interchange.

You are reviewing the application of TC8 (Traffic Control Plan # 8) from the "Contract Provisions and Plans" which have been provided to you by the Project Traffic Control Manager.

Using the following factors, answer the question on the next page:

- this is a freeway with a speed limit of 60 mph
- existing lanes are 12 feet wide
- the shoulder is 10 feet wide
- we are closing a lane and shifting traffic 4 feet onto the shoulder
- the activity area is 1600 feet long
- the termination area is 225 feet long including the downstream taper

Workshop # 1 – worksheet

What are the values of:

X = _____

L = _____

B = _____

R = _____

How long is:

Shoulder Taper = _____

Shifting Taper = _____

Downstream Taper = _____

What is the minimum number of Channelizing Devices you will need?

- Drums = _____

- Cones = _____

What “Type” of Warning Lights will you use on the drums?

- Type _____

What “Type” of Sequential Arrow Sign is required by the contract?

- Type _____

What PCMS Message/s will you use?

What are the work hours specified in the contract? _____

CHAPTER 8

TRAFFIC CONTROL LABOR

8.1 SUMMARY

This chapter covers the requirements for the selection, training, certification and job assignment of traffic control labor. It also discusses the required clothing and equipment used by all workers engaged in traffic control.

8.2 SELECTION OF TRAFFIC CONTROL LABOR

WSDOT, Standard Specifications (M41-10)

“The Contractor shall furnish all personnel for flagging and for the setup and removal of temporary traffic control devices and construction signs necessary to control traffic during construction operations.”

WSDOT, Construction Manual, 1-2.3C(9)

- **Flaggers**

“Typically, flaggers have the highest exposure to traffic hazards and are more frequently injured or killed than other workers. **Flaggers should only be used when all other forms of traffic control are inadequate to control traffic.** When flaggers are used, flagging stations must be shown on the TCP along with the required warning signs and devices. Flagger stations should be protected with a positive barrier, if possible. The flagger should also have in mind an “escape plan” to avoid errant vehicles. It is not recommended to use flaggers at locations, such as freeways, where their primary function of warning or directing traffic is ineffective or not intended. Use of flaggers to exclusively display the “SLOW” message is also not recommended.”

- **Spotters**

“Flaggers used as spotters to protect an exposed work crew may be considered appropriate if other worker safety measures are not feasible. Before the Project Engineer approves the use of a spotter, careful evaluation of the hazards involved should indicate that the spotter can

actually provide a safety benefit to the work crew without undue risk to the spotter.”

- **Traffic Control Labor**

----“For some projects, **labor in addition to the assigned flaggers** is needed to install and remove traffic control in an efficient manner.”

MUTCD, Chapter 6E, Flagger Control

“A flagger shall be a person who provides temporary traffic control.”

“Because they are responsible for road user safety, and because they make frequent contact with the public, **flaggers should have the following minimum qualifications:**

- a. **Sense of responsibility** for the safety of the public and the workers;
- b. **Adequate training** in safe temporary traffic control practices;
- c. **Average intelligence;**
- d. **Good physical condition**, including sight, mobility, and hearing;
- e. **Mental alertness** and the ability to react in an emergency;
- f. **Courteous but firm manner; and**
- g. **Neat appearance.”**

8.3 TRAINING AND CERTIFICATION

MUTCD, Chapter 6B

“ **Each person** whose actions affect temporary traffic control zone safety, from the upper-level management through the field workers, **should receive training** appropriate to the job decisions each individual is required to make.”

WSDOT, Standard Specifications (M41-10)

“The TCM (Traffic Control Manager) and the TCS (Traffic Control Supervisor) shall be certified as a worksite traffic control supervisor by one of the organizations listed in the Special Provisions.”

(Each TCM /TCS must be re-certified as a work zone “Traffic Control Supervisor” every four years.)

“Flaggers and spotters shall possess a current flagging card ----“

WAC 296-155-305 Signaling and Flaggers

“Job site workers with specific traffic control responsibilities must be trained in traffic control techniques, device usage, and placement.”

“Each flagger must have in their possession either a valid Washington traffic control **flagger card** or a valid flagger card from a state, such as Oregon, Idaho or Montana, having flagger training reciprocity with Washington.”

“Each flagger must be trained every three years.”

8.4 PERSONAL PROTECTIVE CLOTHING

WAC 296-155-200 Personal Protective and Lifesaving Equipment

“Employers shall ensure that **employees wear no less than a short sleeved shirt, long pants, and shoes.** Employees shall wear no less than a short sleeved shirt, long pants, and shoes.”

WAC 296-155-212 Foot Protection

“**Substantial footwear**, made of leather or other equally firm material, **shall be worn** by employees in any occupation in which there is a danger of injury to the feet through falling or moving objects, or from burning, scalding, cutting, penetration, or like hazard.”

WSDOT, Work Zone Traffic Control Guidelines (M54-44)

Personal Protective Wear:

“The wearing of soft caps is permitted, except when required by state safety regulations WAC 296-155-205, WAC 296-155-305 and WAC 296-24-084 and when working on or around the following:

- Asphalt Plant, Crushers, Blasting Area, Asphalt grinding operations.
- Construction of bridges, structures. Retaining walls, etc.

- Overhead work such as working in a trench, rock-fall areas, sign installation, installing poles, work under bridges, electrical conductors, etc.
- Working near operating equipment with arms, booms, buckets, etc.
- Working around cranes, pile driving, drilling.
- During work as a flagger.
- Brush cutting work, danger tree work, other logging operations.
- Any designated hard hat area.

Supervisors have the authority to require employees to wear hard hats for other activities where there is a danger from impact and/or penetration of falling and flying objects. Employees must have a hard hat on site and readily available for use when work conditions require their use.”

Traffic Vest, Coveralls, Rain Gear and T-Shirts

“While working on foot in a highway right-of-way (fence line to fence line) all WSDOT workers must:

- **Wear reflective vests, except that during daylight hours, clothing of orange, yellow, strong yellow green or fluorescent versions of these colors may be worn in lieu of reflective vests.**
- **During hours of darkness, wear vests, white coveralls or either high visibility reflective strong yellow green pants with red-orange strip or red-orange pants with lime yellow strip.**
- **When rain gear is worn during hours of darkness, it shall be white or yellow.**
- **The reflective vest shall always be the outermost garment.**

Exceptions to these requirements are: (1) when personnel are out of view of, or not exposed to, traffic, (2) when personnel are inside a vehicle, or (3) where it is obvious that such apparel is not needed for employee safety from traffic.”

WSDOT, Standard Specifications (M41-10)

“Workers engaged in flagging or traffic control shall wear reflective (retroreflective) vests and hard hats.”

“ A retroreflective vest and hard hat shall be worn by the TCS.”

WAC 296-155-305 Signaling and Flaggers

“While flagging during daylight hours, a flagger must, at a minimum, wear:

- A **high visibility safety garment** designed according to Class 2 specifications in ANSI/ISEA 107-1999. American National Standards for High-Visibility Safety Apparel.
Specifically, a garment containing at least 775 square inches of background material and 201 square inches of retroreflective material that encircles the torso and is placed to provide 360 degrees visibility around the flagger. The acceptable high visibility colors are fluorescent yellow-green, fluorescent orange-red or fluorescent red; and
- A **high visibility hard hat**. The acceptable high visibility colors are white, yellow, yellow-green, orange or red.
- When snow or fog limit visibility, a flagger must wear pants of any high visibility color other than white.”

“While flagging during hours of darkness, a flagger must at least wear:

- A **high visibility safety garment** designed according to Class 2 specifications in ANSI/ISEA 107-1999 over white coveralls, or other coveralls or trousers that have retroreflective banding on the legs designed according to ANSI/ISEA 107-1999 standards; and
- A **high visibility hard hat** that is marked **with at least 12 square inches of retroreflective material** applied to provide 360 degrees of visibility
- For the purpose of this rule, **“hours of darkness”** means one-half hour before sunset and one-half hour after sunrise.

- When snow or fog limit visibility, pants, coveralls, or rain gear in a highly visible color with retroreflective banding on the legs designed according to ANSI/ISEA 107-1999 must be worn.”

“Note: High visibility safety garments made of mesh material may be worn by flaggers if they meet the chromaticity requirements of ANSI/ISEA 107-1999, American National Standard for High-Visibility Safety Apparel.”

8.5 SPECIAL EQUIPMENT

WSDOT, Standard Specifications M41-10

“The Contractor shall furnish the MUTCD standard **Stop/Slow paddles** (18 inches wide, letters 6 inches high, and reflectorized (retroreflectorized) for the flagging operations.”

WAC 296-155-305 Signaling and Flaggers

“When **sign paddles** are used, they must comply with the requirements of MUTCD, 1995 Edition-Revision 4, part VI.
Specifically, sign paddles:

- **Must be at least 18 inches in diameter;**
- **Printed with letters at least 6 inches high;**
- **The “STOP” side of the paddle must have a red background with white lettering; and**
- **The “SLOW” side of the paddle must have an orange background with black lettering.**

When hand signaling is used during hours of darkness, sign paddles must be retroreflective or illuminated in the same manner as signs.”

*A 24-inch STOP/SLOW paddle should be used when greater visibility is necessary due to conditions such as, **high speed roads or night flagging**. In order to make the flaggers’ signals more visible to traffic at night they may also be equipped with retroreflective gloves and/or a hand held lighting device, such as a flashlight equipped with a six to eight-inch red, orange, or high visibility yellow-green nose cone.*

Standard Specification

Flaggers should be equipped with an audible warning device, such as a whistle or horn, so they can adequately warn workers of any impending danger.

Flaggers shall be equipped with portable two-way radios

Radios shall be capable of having direct contact with project management foreman, superintendents, etc.

8.6 SUPERVISION OF TRAFFIC CONTROL LABOR

TOOLS FOR SUPERVISION

This segment will provide the Traffic Control Supervisor with some basic fundamentals on communication, organization and management practices. These skills are necessary to effectively manage the resources available to you in order to safely complete the end goal ~ project completion.

Leadership

The American Heritage Dictionary defines leadership as "the capacity or ability to lead." This or any definition infers that one who leads must have certain abilities, traits or skills. It is safe to assume that these skills are developed from birth, through the formative years and into adulthood. It is an ongoing process that will never be completed. We will never be the "best," we can only strive to be a "better" leader or supervisor.

Many articles and books have been written on the subject of "leadership skills," and you as a foreman or supervisor may have read some of the material that has attempted to define what these skills are. It is very possible that you have and are currently using these skills everyday. Some of these skills are for managing people and some of these are technical skills.

With the volume of printed materials and literature concerning leadership and supervisory skills, it is hard to determine what traits are important in supervisors. However, we have put together a list of skills needed for being a good supervisor.

Dependability - As a supervisor you have the duty to achieve the goals that have been set. A Traffic Control Zone can present many different and sometimes difficult objectives that must be met and carried out. A reliable supervisor is a necessity.

Diplomatic - The supervisor must have the ability to interpret the policies and practices of the company and explain these to all workers and visitors on the site.

Discipline - A supervisor must have the confidence in his/her abilities as a leader to make the right moves at the right time. He/she must know when and how to act, according to the rules and regulations at the site. You must not be persuaded to alter or adjust the standard operating procedures at others request. You must also be trained to know not only how and why a task is done, but also why the procedure must be done properly.

Enthusiastic - A keen interest in the job as it progresses and in your fellow workers, is an important human skill on a traffic control job. You must be able to convey this interest in a positive way to show that you are concerned about the worker, the motorist, the pedestrian, the flagger, and the contractor. The energy and adrenaline must flow. It does take effort, but the effort is contagious and worthwhile. Enthusiasm spreads.

Motivated - Not only must you be enthusiastic, but you must be prompted to an action with a sense of purpose. This is why training is important. You must know the proper actions to take and you must also know the purpose, or the reason for taking those actions. Again, motivation can and will be contagious, if done in a positive manner.

Recordkeeping - As the designated "Certified Traffic Control Supervisor" you will be required by the Washington State Department of Transportation to keep a complete and accurate daily diary of the job site. Due to liability associated with traffic control projects, this diary may be needed in the future by the D. O. T., your company, or more important, by you, to document your actions.

Responsible - The certified traffic control supervisor has a greater magnitude of responsibilities and liabilities, but unlike normal construction sites, the supervisor should have written objectives and procedures. By being disciplined and motivated you will be able to successfully, without injuries or exposures, complete the objectives. It is your duty and obligation to be accountable and liable for your actions, and the actions of your crew. By following the written procedures, you are fulfilling your duties and have acted in a responsible manner.

Understanding - Traffic control sites and the worker can be complex and confusing. It is important that a supervisor comprehend the sometimes-vague elements of the site and workers. Each is different and inseparable. You must muddle through the politics of human actions and reactions. You must learn why Joe has been late the last three mornings in a row and you must know how his late arrivals affect others on the crew and the progress of the clean up. You must be open to the current and flow of workers, workers moods and how they impact the site and work. It is up to the supervisor, to interpret and adapt to these issues, in order to ensure smooth completion of the project.

Vigilant - As a supervisor you must keep your hand to the pulse, your ear to the rail. You must be aware of what is going on around you. You must expect the unexpected and; you must be keenly watchful to detect danger and changes. Being safe relies on observation for unsafe conditions and acts. Being a good supervisor relies on knowing all that goes on around you. But, you must be disciplined and motivated to follow the right procedures. It is not enough to be aware, you must act on the knowledge gained. A good supervisor does not allow others to do his job, to fulfill his/her responsibilities. The supervisor must act.

BASIC FUNDAMENTALS

All organizations, whether they are manufacturers of a product, providing services, or a traffic control contractor have only four resources to utilize: People, Money, Materials, and Time. Most organizations will tell you the most important ingredient is people.

Influencing behavior of other people is perhaps one of the most important parts of a "Traffic Control Supervisor's" job. Management, after all, is getting the right things accomplished through the active support of others. But gaining the active support of other people doesn't necessarily come naturally. It's a supervisor skill, which has to be learned.

So, in order to get the positive results you want from the people with whom you work, you must behave; that is, express feelings, utilize your skills, and show attitudes toward them in the same way that you would have them behave toward you. Simply put, the basic fundamentals that will be discussed are:

Give Clear, Complete Instructions.

Not only does a supervisor need some level of human and technical skill but also he or she must have the mechanism to convey these abilities to workers, co-workers and superiors. That mechanism is communications. The definition of communication is the act or process of exchanging or inter-changing thoughts or information. Exchanging or interchanging thoughts involves not only spoken words, but facial expressions, gestures and body movements. Studies have shown that supervisors can be expected to devote 50-90% of their time to communicating. This explains the importance of the "communication cycle." Communication involves five (5) key points:

- Take time giving instructions
- Show **how** whenever possible
- Keep information simple and logical
- Ask for feedback, "do you understand"

- Follow-up the next day or later to see if instructions were followed correctly

As a supervisor and human you have the skills mentioned above. You may have these skills at varying levels. Some of you may be very good at it, some not.

Communicate - Let Employees Know How They Are Doing

One (1) is the "**Communication Cycle.**" All the skills you have and the implementation or use of those skills is dependent on the level of communication skills you have. A person who has all the necessary skills may not be a "communicator" and therefore cannot be a supervisor. Many try and many are not good supervisors. Most people however, have adequate communication skills and survive the "cycle."

The next item or hurdle that the "potential" supervisor must clear is "**attitude,**" in particular his or her attitude. At this juncture a person can be generally supportive, optimistic and complimentary or he/she may be demeaning, passive and pessimistic. You know what traits a good supervisor would display.

A supervisor must be informative and he/she must be able to pass on the technical information and complex procedures in a way that is clear and understandable. A supervisor/teacher must be enthusiastic. Motivated, understanding and vigilant. A supervisor must know when his teachings are not being absorbed, and how to avoid or overcome that situation. A teacher must not be afraid of sharing knowledge and he or she must be confident in his/her abilities. A good supervisor is willing to give all information, the **how** and **why**, not just the "because I said so." The supervisor/teacher is also an example, a person, a fellow worker, a human being, one that workers can look to and respect.

Give Credit When Due

Research shows that people work at levels that are consistent with their perceptions of their own competence. Those perceptions are directly related to self-esteem. Furthermore, those perceptions can be significantly enhanced or damaged by the way a supervisor relates to an employee.

The direct relationship between an employee's level of self-esteem and an employee's level of performance makes the maintenance and enhancement of self-esteem a critical managing tool. For one of the obvious goals of the asbestos supervisor is to increase productivity by raising levels of performance. An employee who feels competent is much more likely to perform competently.

One of the most important principles is the use of reinforcement techniques, especially positive reinforcement. Because the events that follow a given behavior are important to most people, reinforcement techniques are a potent method of changing behavior - either strengthening desirable behavior or diminishing undesirable behavior. There are two strategies that you can use to change behavior:

- **Positive Reinforcement.** One way to increase the likelihood of a performance or behavior recurring is to follow that performance with a positive event. A positively reinforced response has a greater probability of recurring simply because it pays off.
- **Punishment.** One way to decrease the likelihood of recurrence of a behavior is to follow the behavior with an unpleasant event. A response is punished when the following event causes the behavior to decrease in frequency. There are often negative side effects associated with punishment, so it must be used selectively.

Despite the fact that each strategy listed can successfully modify or change behavior, it is recommended that **Positive Reinforcement** be used most often. Generally speaking, positive reinforcement has a much more predictable effect than punishment. Punishment does not weaken behavior as effectively as positive reinforcement strengthens behavior. Although many supervisor's will point to the effectiveness of punishment, research shows that punishment can have negative side effects. The side effects of criticism or punishment are:

- Defensive behavior
- Hostility, anger, de-motivation
- Sabotaging behavior

The primary result of using positive reinforcement is that performance improves because there is an increase in the frequency of *atta-boy's*.

Involve people in your decisions.

We make decisions constantly, but most of us are not aware of the procedures or steps we take to arrive at a decision. The supervisor on a site will be faced with many decisions and it will be sometimes necessary for the supervisor to solve complex problems. The following basic steps have been generally accepted as a way to arrive at a decision.

1. Identify the problem
2. State the basic objective or goal
3. State the constraints, assumptions and facts
4. Generate possible solutions and evaluate them

5. Select a solution and break it into component parts
6. Create a detailed plan to obtain the objective

The supervisor must make information available to the workers in his/her crew. It is the supervisor's responsibility to pass on his/her knowledge and make it available to all. On the other hand, it is important to gather as much information from other people on the situation in order to reach an informed decision.

All the workers on a traffic control project have been trained and most are knowledgeable in the aspects of the site. You, as a supervisor, must know at least as much. The best supervisors have broad and deep insight of the project and people. You must keep abreast of current developments, state-of-the-art equipment/procedures and new innovations. Discussions with others research and experience, can contribute to a broadening of your knowledge. You must be motivated to read magazines, periodicals, and trade publications to keep up to date. Other courses and academic offerings can be helpful to improve and expand your knowledge.

Maintain an Open Door Policy.

Often, the most effective solutions to on-the-job situations can be determined only if open communications are established and maintained between supervisors and employees. Since you, being the "boss," can always speak up and make use of your "high potency" position, your efforts to create more effective on-the-job communications invariable need to be directed toward helping your employees talk more freely. Encourage them to offer personal reactions, opinions, suggestions, and problem-solving ideas in a non-defensive manner, which builds their self-esteem, self-confidence, competence, and personal involvement.

Rather than shutting off input from employees, a supervisor should be concerned with maximizing the flow of information from employees. In short, supervisors should encourage, first, the employee to talk more; and, second, to talk less themselves.

ORGANIZATION

The best supervisors are also the best organizers. He/she must be able to direct personnel and equipment in the most efficient manner. Productivity is directly related to the organization the supervisor displays. The supervisor is generally needed in many different locations at the same time, meeting and dealing with workers, consultants and building owners.

Planning Ahead

Step six of the decision making process is to create a detailed plan. First of all, the plan must be attainable with the workers and equipment you have at your disposal. If not, frustration ends up making the plan counter-productive. Secondly, you must take everything that has been talked about in this section thus far, and lay out steps of action. It is still up to you to assign the workers and material, and to motivate, until the process or procedures are accomplished. Next to organization, planning is the most important aspect of the supervisor's job.

Establishing Priorities

Know your priorities. It's well worth the effort to sit back and decide not only what you want done, but also in what order you want it done. Establishing these priorities up front will decrease the potential for misunderstandings and missed target dates. When people have specific guidelines and priorities to follow, interpersonal and job-related "complications" are far less likely to occur.

Setting your priorities is a crucial part of any plan. It helps you to decide what is important and not important, what must be dealt with now and what can be put off until later. Supervisors, who can quickly prioritize their plans, will be capable of obtaining their end goal more efficiently.

When putting your plan to work, the supervisor will need to constantly re-prioritize the tasks as the project progresses. If today's task does not get completed because of lack of time, that does not mean it should be number one on the list tomorrow. The most important or crucial task at the moment must have top priority.

Setting your priorities is not as simple as it looks, it is part of the six step decision making process discussed earlier. Setting priorities can be an enormous challenge for the supervisor and learning to follow such a method will help you to achieve your goals.

Setting Goals

It is important that the supervisor set goals for the workers, who need to know what is expected of them on the job. The short-term goals for the present job need to be explained. While longer-term employees may need only limited direction to effectively carry out a job, shorter-term employees may need more direction from the foreman or other workers. Long term goals, like job advancement, also must

be made clear to the workers. Job advancement may be to a foreman's level, or to a more interesting job.

GOOD MANAGEMENT PRACTICES

Supervising styles can vary considerably from person to person. A new supervisor is faced with unfamiliar challenges and mental stress. If this happens, that person can sometimes react negatively and end up losing the respect of the workers right from the beginning. If you use the following simple guidelines in your new position, it should help make the transition easier--both for you and your new employees.

Don't Be Power Happy

Supervisors have been known to become "Power Happy" after receiving their newfound authority. You need to protect yourself from inflating your own ego with self-worth and elevated importance. A good supervisor would never ask his workers to do anything that he would not do also.

By occasionally jumping in and getting dirty alongside the crew, the supervisor will begin to gain additional respect from the workers and humble himself in the process. However, do not jump in and believe that your short burst of energy will motivate the crew to last for eight hours. On the other hand, you can't do a proper job of supervising if your doing all the work.

Have Patience

Your patience will be tested from several different angles. You will have new paperwork to fill out and meetings to attend, budgets to stay inside of and deadlines that must be met. New hires with little or no actual experience may take longer to perform their duties than you allowed for and slow the schedule up.

When you feel that you are losing your patience, slow down momentarily and step back, take a deep breath; now, put things in perspective. Remember, worry about changing the things that you can control, **NOT** the things you can't.

Learn To Delegate Responsibility

The key to time management for the supervisor is learning how to delegate responsibility and authority. Knowing how to delegate is critical to increasing your own productivity as a supervisor. Initially, however, it can be a difficult skill to learn. People are usually promoted into management because they've shown a talent for getting results. But once you're a supervisor, you don't have enough

time to get the results demanded all by yourself. You have to get other people to produce the results for you. You have to multiply your talent through the talents of others.

As you begin this process, your initial reaction will be to delegate the work you find unpleasant or boring and keep the work that gives you psychic rewards. The important thing to realize is that the same work you find unpleasant or boring will probably be judged in the same way by those to whom you delegate it. So, as you make your list, be tough-minded about not keeping all the "gems" for yourself!

Don't let the "80-20 Rule" rule you. The 80-20 Rule, also known as Plato's Principle, states that 20% of your people do 80% of the work, while the other 80% of your people do the remaining 20% of the work. If you relate the 80-20 Rule to your own organization, you'll probably find the proportions are close, if not exact. You'll also find that you'll be tempted to delegate to that 20% almost exclusively.

Resist the temptation! If you let the 80-20 Rule you, you will "burnout" your producers, while failing to give the other 80% an opportunity to grow by assuming responsibility. The result? A very real danger of increasing turnover in both groups because your producers will see themselves as unfairly overloaded, while some of the other 80%, will see a lack of opportunity.

Evaluate Your Decisions

When making decisions, look at both sides of the issue, write the pro's and con's down on a piece of paper before deciding. Your verdict will affect other people and businesses. Therefore, try not to "shoot from the hip" too often, as you are the one who must live with it, and an uninformed decision may be too expensive.

Take the time during each day to think about what is ahead so that you may plan and prepare for those projects. You will soon learn that by pre-planning and becoming prepared for the day's events, the project will proceed smoother, and you will be better equipped for decisions and emergencies that will come up throughout the job.

Supervising Friends

You are now the supervisor of the project and friends may attempt to solicit preferential treatment. This must never be allowed to happen. It is vital that relationships be kept professional, fair, and equal at all times.

If this principal is ignored, you may jeopardize losing the rest of the crew's respect and create hard feelings. Then groups or cliques will begin to form creating

friction and conflicts between personnel, all of which is counterproductive for both you and the project.

Problems with Personnel

Interpersonal conflicts are like a contagious disease, they can spread very quickly if not isolated and treated as soon as possible. Still, many supervisors are reluctant to move quickly once they become aware of an interpersonal conflict between two employees on their crew.

The motives aren't difficult to understand. The very phrase, "interpersonal conflict", means the dispute is private. The "Don't butt in" and "It's not my responsibility", ethic is strong in our society, especially as we relate our private lives to the private lives of others. Supervisors may become confused about playing a role that seems to get stuck between the public world of work, and the more private world of interpersonal conflicts. There are three things that you should do to help you in settling these conflicts.

- **Develop an early warning system.** One-on-one meetings with each of the employees on your crew will often allow you to detect conflicts before they become bitter. Ask your employees open-ended questions, such as, "Do you feel everyone is doing their fair share?" If that person singles out another worker, then ask the same questions to that person.
- **Don't procrastinate if you see a conflict.** Reasons for procrastinating, rather than settling the dispute can range from feeling you're too busy, to worrying about a confrontation, to hoping the problem will work itself out in time. Strangely enough, managing your time well is one of your most important assets as a supervisor, and you will spend less time settling conflicts if you settle them quickly.
- **Develop a plan to deal with personnel.** We actually spend very little time planning on how to deal with other people. Supervising people is not some kind of an "art" that can only be learned through years of experience; it's a process that can be learned through careful preparation and practice.

EMPLOYMENT PRACTICES

Problem Solving

Workers will have problems on traffic control jobs. Not only will they face the normal problems associated with any work, but also those that can surface when

workers are being exposed to traffic, or are being told not to perform the job safely and correctly. Workers may have concerns about various aspects of the work situation. The supervisor who understands the job requirements and who takes the time to explain them can help relieve problems.

The supervisor should be aware when problems of any kind appear on the job. Workers often are the first to recognize a problem on the job, and should be encouraged to report all problems immediately. The supervisor must then take measures to correct problems before accidents occur. The supervisor should inform the workers what is being done to correct the problems.

Supervisors should understand that workers have alternatives if their valid complaints are neglected. If workers think their health is threatened, they can report their problems to state and federal agencies.

Hiring Practices

Some supervisors may be responsible for hiring new employees. In the event that this becomes your responsibility, there are several points of law that a supervisor must be aware of. Job discrimination on the basis of race, color, creed, national origin, sex, marital status, HIV status, age or handicap is illegal.

If you are responsible for the hiring, here are some of the questions that may **not** be asked during pre-employment interviews:

- a. Have you ever been arrested?
- b. Questions which show preference for persons under 40 years old.
- c. Whether applicant is a citizen.
- d. Information regarding spouse, spouse's employment, or salary, children, childcare arrangements, or dependents.
- e. Health or handicap inquiries unrelated to fitness to perform job.
- f. Height/weight questions.
- g. Marital status.
- h. Type or condition of military discharge.
- i. Inquiries about applicant's name or national origin that divulges marital status, lineage, ancestry, descent, birthplace, mother tongue.
- j. Questions asking applicant to list clubs, organizations, societies, or lodges to which they belong.
- k. Requests for photographs.
- l. Inquiries concerning race, color of skin, hair, eyes etc.
- m. Inquiries about religion or creed.
- n. Names of person with whom you reside-whether you rent or own.
- o. Any inquiry concerning sex.

Disciplining the Employee

When discipline is necessary, it should come as no surprise. As a rule, it should have been preceded by a discussion around improving the employee's performance. But, when the specific objectives set in the performance improvement discussion are not met, then discipline may be necessary.

Employees may not be disciplined on the basis of race, color, creed, national origin, sex, marital status, HIV status, age or handicap. All employees should be informed, in writing, of the company's disciplinary and termination policies. Disciplinary action may be taken for any variety of reason including:

- Failure to comply with health and safety regulations.
- Tardiness to work.
- Drug and/or alcohol use on the job
- Insubordination
- Theft of company property

Some types of action that may be taken against the problem employee may include verbal warnings, a written reprimand, suspension and lastly, termination. Regardless of the company infraction made (and how many times it was made), you and your company must have clear-cut guidelines for determining the severity of the infraction and the type of action to be taken.

Discipline should be specific, and it should fit the offence - that is to say, it should be neither too severe nor too lenient. Above all, a supervisor who disciplines an employee must follow through. Otherwise, his or her credibility will be destroyed and, with it, the ability to lead.

Know also, that discipline often evokes a hostile reaction from the employee being disciplined. Such reactions can be avoided by remembering to keep your focus on the behavior, the circumstances or the actions that have led to this meeting. Afterward, write down as much of the word-for-word conversation as you can remember, (document) and keep it on file. If, later, you find that discipline is ineffective with a certain employee, you may choose to terminate him/her. In that case, your file of previous discussions and disciplinary actions is essential.

Important: The purpose of discipline is not to punish; but to improve performance and thus productivity.

- Review past discussions and agreements.
- Ask why performance agreements have not been met
- Describe the disciplinary action you are taking.
- Summarize the necessary actions to be taken and offer your assistance.

Terminating the Employee

Employees may not be fired on the basis of race, color, creed, national, origin, sex, marital status, HIV status, age or handicap. All employees have already been informed, in writing, of the company's termination policies. Termination action may be taken for any variety of reasons including:

- Failure to comply with health and safety regulations.
- Habitual tardiness to work.
- Use of alcohol or drugs on the job.
- Insubordination
- Theft of company property

Again, regardless of the company infraction made, you and your company must have clear-cut guidelines for determining the severity of the infraction and if termination is a justified action to take. Remember:

- Inform employees of the rules **when hired**, in writing.
- Investigate infractions fairly - get **all** the information.
- **Document** all decisions.

The inability to terminate is often the telltale flaw in a supervisor who is otherwise quite successful. The reality of having to confront another human being and tell that person they haven't made the grade can be so overwhelming that some people will do anything to avoid it.

The act of termination itself should be well organized and should not be a lengthy meeting. It is not a time for debate or long discussions, these should have already taken place during the time when the employee was trying to improve his or her performance or was being disciplined. During your conversation with the employee, remember to:

- Outline the lack of improvement in job performance.
- Inform the person of the decision to terminate him/her.

- Respond to the person's reaction, listening actively while keeping the focus on the causes for termination.
- Outline personnel actions which have been taken.
- Offer continuing assistance and support.

Sexual Harassment

It is illegal in the State of Washington to harass someone on the basis of their sex. Construction is a predominantly male occupation, which may provide an atmosphere that is conducive of harassment situations. Sexual harassment may include:

- Sexual jokes, comments and innuendoes
- Unwelcome invitations to sexual activity
- Unwelcome touches, pinches and hugs
- Pressure to engage in sexual activity as a condition of employment or promotion
- Sexual assault

Remember what one person views as being harassment may not be by another. You as the supervisor on the job and the employers most direct representative, are responsible for recognizing and dealing with harassment, such as:

- Sexual harassment by management - whether the employer knows about it or not.
- Sexual harassment by co-workers, if the employer knows about it, but does nothing.
- Sexual harassment by non-employees in the workplace such as vendors, customers, consultants, air monitoring technicians, etc. - if the employer knows about it and does nothing.
- Sexual harassment that results in promotion of one employee over other employees who are denied raises or promotions because of sexual harassment directed at another employee.

Note: Sexually harassed employees can sue for damages. These sexual harassment complaints against employers have brought large financial awards to victims in recent years.

If an employee complains to you about sexual harassment on the job, remember to:

- Listen attentively, don't laugh.
- Never assume it was the employee's fault.
- Encourage the harassed employee to say **NO**.
- Take action, talk to the offender -follow the companies standard disciplinary procedures.
- Take action immediately! If you don't, it will only get worse.

As the designated supervisor responsible for your project, what should you do to help prevent this problem? Here are a few recommendations:

- Distribute and post a written policy that sexual harassment will not be tolerated.
- Train management, staff and employees in ways to deal with sexual harassment.
- Establish procedures for registering sexual harassment complaints as part of company procedure.

CHAPTER 9

FLAGGING

9.1 SUMMARY

This chapter covers the proper use of flaggers in temporary traffic control situations. Criteria for selecting and maintaining proper traffic controls and the safe and effective positioning of flagger stations will be addressed. This chapter will also present guidance on flagging techniques to reduce the potential hazards associated with this type of traffic control. WSDOT policies and WAC 296-155-305, Signaling and Flaggers, will be discussed in detail.

9.2 THE FLAGGING FUNCTION

- A Flagger shall be a person who provides temporary traffic control.

WSDOT Construction Manual , WAC 296-155-305 and M54-44

- The primary function of temporary traffic control is to move vehicles and pedestrians safely and expeditiously through or around work zones while protecting on-site workers and equipment. **“Flaggers are to be used only when other reasonable traffic control methods will not adequately control traffic in the work zone.”** Flaggers are used to stop traffic intermittently at worksites and to assign right-of-way, or to slow traffic past the activity area to help protect the work crew.
- More than one flagger may be necessary to achieve traffic control in both directions.

WSDOT Construction Manual

- **“It is not recommended to use flaggers at locations, such as freeways, where their primary function of warning or directing traffic is ineffective or not intended.”**
- **“Use of flaggers to exclusively display the “SLOW” message is also not recommended”**

- **Uniformed law enforcement officers may be used** as flaggers in some locations, such as an urban intersection, where enforcement of traffic movements is important.
- Flaggers and workers should be advised that **every reasonable effort must be made to prevent excessive delays to the motoring public.**

9.3 FLAGGER STATIONS

MUTCD 2000

The following should be considered when selecting flagger stations:

1. **“Flagger stations shall be located far enough in advance of the work space so that approaching road users will have sufficient distance to stop before entering the work space.”**

As much advance sight distance as can reasonably be obtained should be provided in selecting the flagger station. This is especially critical at crest vertical curves and at horizontal curves where the flagger station must be moved upstream to assure adequate sight distance for approaching traffic.

The distance from the flagger station to the work space must be long enough to enable an errant motorist, who has failed to obey the instructions of the flagger and has impacted the channelizing devices defining the transition area, to bring his or her vehicle to a complete stop.

2. **“The flagger should be stationed sufficiently in advance of the workers to warn them** (for example, with audible warning devices such as horns, whistles, etc.) **of approaching danger** by out-of-control vehicles.”
3. The following table shows **recommended “Distance of Flagger Station in Advance of Work Space”** from the MUTCD.

Table 6E-1. Distance of Flagger Station in Advance of the Work Space

Speed* (km/h)	Distance (m)	Speed* (mph)	Distance (ft)
30	10	20	35
40	15	25	55
50	30	30	85
60	45	35	120
70	65	40	170
80	85	45	220
90	110	50	280
100	135	55	335
110	170	60	415
120	205	65	485

*Posted speed, off peak 85th-percentile speed prior to work starting, or the anticipated operating speed

“This buffer distance may be increased for downgrades and other conditions that affect stopping distance.”

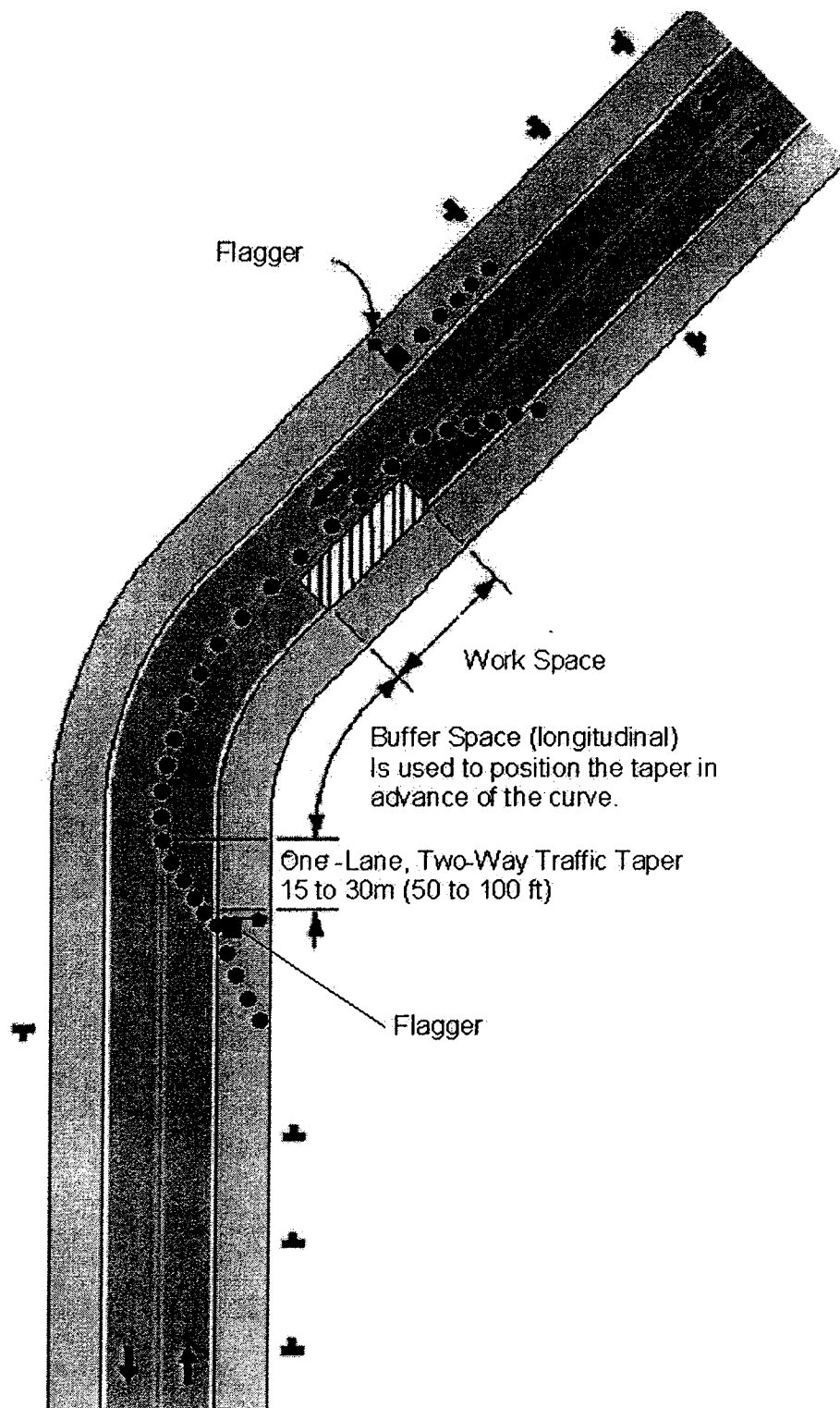
4. **“The flagger should stand either on the shoulder adjacent to the road user being controlled or in the closed lane prior to stopping road users.”**
5. **“A flagger should only stand in the lane being used by moving road users after road users have stopped.”**
6. **“The flagger should be clearly visible to the first approaching road user at all times.”**
7. **“The flagger should also be visible to other road users.”**
8. **“At a spot constriction, the flagger may have to take a position on the shoulder opposite the closed section in order to operate effectively.”**
9. **“Table 6E-1 may be used to determine the visibility distance for road users approaching the flagger.”**

10. **“At spot lane closures where adequate sight distance is available for the safe handling of traffic, the use of one flagger may be sufficient.”**

WSDOT, Work Zone Traffic Control Guidelines, M54-44

11. **“Locate the flagger off the traveled portion of the roadway.”**
12. **“In a mobile flagging operation, all signs associated with the flagger must be moved ahead whenever work advances to more than 2 miles from the advance warning signs; also the “FLAGGER AHEAD” (symbol or text message) sign is recommended to be within 1,000 feet of the flagger, any time the flagger is deployed.”**

Certain geometric situations or traffic conditions may require more than one flagger station for each direction of traffic. Intersecting roadways within the activity area may require additional flagging control, and relay flaggers may be needed where the alignment of the highway precludes visual contact between flaggers and other methods of communication are unavailable.

Figure 6C-3. Example of a One-Lane, Two-Way Traffic Taper

9.4 FLAGGERS RULES OF CONDUCT

To perform their duties properly, **flaggers should conduct themselves according to the following rules of conduct:**

WSDOT, Work Zone Traffic Control Guidelines M54-44

Flagger Rules of Conduct

- Be clearly visible to approaching traffic at all times.
- Motorists should be able to see you from 500 feet away.
- Do not stand in front of parked/stopped vehicles.
- Always be aware of oncoming traffic.
- Do not step into, or turn your back on traffic.
- Stand on the shoulder of the road observing traffic and the work zone. Sometimes you may have to stand on the opposite side of the road to effectively direct traffic around the work area.
- Choose the best flagging position that will provide the greatest color contrast between you and the background.
- If at all possible, do not stand in the shade.
- Never flag from inside a vehicle.
- Do not lean, sit or lie on a vehicle.
- Stand alone. Do not permit a group of workers to congregate around you.
- Familiarize yourself with the nature of the work being performed. Be able to answer motorists' questions.
- Establish a warning signal with the work crew in case of an emergency.
- Plan an escape route in case of an emergency.
- Stay alert! Be ready to respond to an emergency.
- Record the license number and description of any vehicle whose driver disobeys your instructions and threatens the safety of the work area. Report information to authorities.
- Be courteous and professional.
- Keep your mind on your job. Be aware of the work in progress.
- Do not do any other work when flagging.
- Do not use cell phones or pagers while performing flagger duties.
- Do not involve yourself in unnecessary conversation with workers, pedestrians, or motorists.
- Do not leave your position until you are appropriately relieved.
- Cover, turn or remove the "FLAGGER AHEAD" sign when a flagger is no longer on duty.
- Always carry your flagger certification card while on the job.

9.5 WAC 296-155-305 SIGNALING AND FLAGGERS

The following WAC (Washington Administrative Code) applies to all employees flagging traffic in Washington State.

WAC 296-155-305 Signaling and Flaggers.

- (1) (a) Except as otherwise required in these rules, traffic control devices, signs and barricades must be set up and used according to the guidelines and recommendations in the Federal Highway Administration's: Manual on Uniform Traffic Control Devices (MUTCD), 1995 Edition-Revision 4, part VI, Standards and Guides for Traffic Controls for Street and Highway Construction, Maintenance, Utility, and Incident Management Operations.
- (b) **Job site workers with specific traffic control responsibilities must be trained in traffic control techniques, device usage, and placement.**
- (2) (a) Flaggers or other appropriate traffic controls must be used when signs, signals, and barricades do not provide necessary protection from traffic at operations on or adjacent to a highway or street.
- (b) **Flaggers are to be used only when other reasonable traffic control methods will not adequately control traffic in the work zone.**
- (3) Flagger signaling directions must conform to the guidelines and recommendations of MUTCD, 1995 Edition-Revision 4, Part VI, as amended by the Washington state department of transportation (WSDOT) pamphlet, "*Washington State Modifications to the MUTCD.*" (M 24-01)
- (4) (a) **Flagger hand signaling must be by sign paddles** or lights approved by WSDOT. During emergency situations, red flags may be used to draw a driver's attention to particularly hazardous conditions. In non-emergency situations, a red flag may be held in a flagger's free hand to supplement the use of a sign paddle or lights.
- (b) When sign paddles are used, they must comply with the requirements of MUTCD, 1995 Edition-Revision 4, Part VI. Specifically, sign paddles:
 - Must be at least 18 inches in diameter;
 - Printed with letters at least 6 inches high;
 - The "STOP" side of the paddle must have a red background with white lettering; and

- The “SLOW” side of the paddle must have an orange background with black lettering.
- (c) When hand signaling is used during periods of darkness, sign paddles must be retroreflective or illuminated in the same manner as signs.
- (5) (a) While flagging during daylight hours, a flagger must, at a minimum, wear:
- A high visibility safety garment designed according to Class 2 specifications in ANSI/ISEA 107-1999, American National Standard for High-Visibility Safety Apparel. Specifically, a garment containing at least 775 square inches of background material and 201 square inches of retroreflective material that encircles the torso and is placed to provide 360 degrees visibility around the flagger. The acceptable high visibility colors are fluorescent yellow-green, fluorescent orange-red or fluorescent red; and
 - A high visibility hard hat. The acceptable high visibility colors are white, yellow, yellow-green, orange or red.
 - When snow or fog limit visibility, a flagger must wear pants of any high visibility color other than white.
- (b) While flagging during hours of darkness, a flagger must at least wear:
- A high visibility safety garment designed according to Class 2 specifications in ANSI/ISEA 107-1999 over white coveralls, or other coveralls or trousers that have retroreflective banding on the legs designed according to ANSI/ISEA 107-1999 standards; and
 - A high visibility hard hat that is marked with at least 12 square inches of retroreflective material applied to provide 360 degrees of visibility.
 - For the purpose of this rule, “hours of darkness” means one-half hour before sunset and one-half hour after sunrise.
 - When snow or fog limit visibility, pants, coveralls, or rain gear in a highly visible color with retroreflective banding on the legs designed according to ANSI/ISEA 107-1999 must be worn.

Note: High visibility safety garments made of mesh material may be worn by flaggers if they meet the chromaticity requirements of ANSI/ISEA 107-1999, American National Standard for High-Visibility Safety Apparel.

Note:

You may purchase copies of ANSI/ISEA 107-1999 by writing:

American National Standards Institute
11 West 42nd Street
New York, NY 10036

or

Contacting the ANSI web site at:
<http://web.ansi.org/>

You may read a copy of ANSI/ISEA 107-1999 at any Washington State library.

- (6) (a) **Each flagger must be trained every three years.**
- (b) Flagger training must be based upon the Manual on Uniform Traffic Control Devices-1995 Edition-Revision 4, Part VI, as amended by the Washington state department of transportation pamphlet, "*Washington State Modifications to the MUTCD.*" (M 24-01)
- (c) **Personnel that have not completed a flagger-training course may be assigned duties as flaggers only during emergencies when a sudden, generally unexpected, set of circumstances demands immediate attention. Such emergency assignments are temporary and last only until a certified flagger can be put into the position. For the purpose of this rule, "emergency" means an unforeseen occurrence endangering life, limb, or property.**
- (7) (a) **Each flagger must have in their possession either a valid Washington traffic control flagger card or a valid flagger card from a state, such as Oregon, Idaho or Montana, having flagger training reciprocity with Washington.**
- (b) The flagger card must show the following:
- Verification that the flagger training prescribed in subsection (6) of this section is completed;
 - Date the flagger received their flagger training;
 - Name of the instructor providing the flagger training;
 - Name of the state that issued the flagger card;

- The card's expiration date; and
- Flagger's picture or a statement that says "valid with photo ID."

- (8) **When it is not possible to position work zone flaggers so they are not exposed to traffic or equipment approaching them from behind, the employer, responsible contractor and/or project owner must develop and use a method to ensure that flaggers have adequate warning of such traffic and equipment approaching from behind the flagger.**

Note: The following are some nonmandatory examples of methods that may be used to adequately warn flaggers:

- Mount a mirror on the flagger's hard hat.
- Use a motion detector with an audible warning.
- Use a spotter.
- Use "jersey" barriers.

The department recognizes the importance of adequately trained flaggers and supports industry efforts to improve the quality of flagger training. However, training alone is not sufficient to comply with the statutory requirement of revising flagger safety standards to improve options available that ensure flagger safety and that flaggers have adequate visual warning of objects approaching from behind them. Likewise, the department believes that standard backup alarms, which are already required on construction equipment, do not meet the intent of the legislature on this issue.

- (9) (a) **The employer, responsible contractor and/or project owner must conduct an orientation that familiarizes the flagger with the job site each time the flagger is assigned to a new project or when job site conditions change significantly. The orientation must include, but is not limited to:**

- The flagger's role and location on the job site;
- Motor vehicle and equipment in operation at the site;
- Job site traffic patterns;
- Communications and signals to be used between flaggers and equipment operators;
- On-foot escape route; and
- Other hazards specific to the job site.

- (b) **When flaggers are used on a job that will last more than one day, the employer, responsible contractor and/or project owner must keep on-**

site, a current site specific traffic control plan. The purpose of this plan is to help move traffic through or around the construction zone in a way that protects the safety of the traveling public, pedestrians and workers. **The plan must include, but is not limited to, such items as the following when they are appropriate:**

- **Sign use and placement;**
- **Application and removal of pavement markings;**
- **Construction;**
- **Scheduling;**
- **Methods and devices for delineation and channelization;**
- **Placement and maintenance of devices;**
- **Placement of flaggers;**
- **Roadway lighting;**
- **Traffic regulations; and**
- **Surveillance and inspection.**

- (10) **For all flagging operations a three (3) sign advance warning sequence is required on all roadways with a speed limit below 45 mph. A four (4) sign advance warning sequence is required on all roadways with a 45 mph or higher speed limit.**

Note: The following table contains required spacing for advance warning sign placement.

Road Type	Distances	Between	Advance Warning	Signs
	A	B	C	D
Urban low speed.*	200 ft.	200 ft.	200 ft.	N/A
Urban high speed.*	350 ft.	350 ft.	350 ft.	350 ft.
Rural	500 ft.	500 ft.	500 ft.	500 ft.
Expressway /Freeway	1,000 ft.	1,600 ft.	2,600 ft.	2,600 ft.

- * **Speed category to be determined by Washington State Department of Transportation in cooperation with local jurisdictions.**

- (11) **To protect flaggers, employers, responsible contractors and/or project owners must ensure that:**

- (a) **Flagger workstations are illuminated during hours of darkness by floodlights.**
 - In no case must floodlighting be permitted to create a disabling glare for drivers. The adequacy of floodlight placement and elimination of potential glare can best be determined by driving through and observing the floodlighted area from each direction on the main roadway after initial floodlight setup.
 - Emergency situations are exempt from these illumination requirements. For the purpose of this rule, “emergency” means an unforeseen occurrence endangering life, limb, or property.
- (b) **Warning signs reflect the actual condition of the work zone. When not in use, warning signs must either be taken down or covered.**
- (c) **Flaggers are not assigned other duties while engaged in flagging activities.**
- (d) **Flaggers do not use devices (for example, cell phones, pagers, radio headphone, etc.) that may distract the vision, hearing, or attention of the flagger. Devices such as two-way radios used for communications between flaggers to direct traffic or ensure flagger safety are acceptable.**
- (e) **Flaggers receive appropriate breaks from flagging so they can remain attentive and alert. For the purpose of this rule, “appropriate break” means a rest period of at least 10 minutes, on the employer's time, for each 4 hours of working time.**
 - Rest periods must be scheduled as near as possible to the midpoint of the work period.
 - A flagger must not be allowed to work more than three hours without a rest period.
 - Scheduled rest periods are not required where the nature of the work allows a flagger to take intermittent rest periods equivalent to 10 minutes for each 4 hours worked.

9.6 FLAGGER PROCEDURES

MUTCD 2000, Section 6E.04

The following methods of signaling with paddles **shall** be used:

- **To Stop Road Users**, the flagger **shall** face road users and aim the STOP paddle face toward road users in a stationary position with the arm extended horizontally away from the body. The free arm **shall** be held with the palm of the hand above shoulder level toward approaching traffic.
- **To Direct Stopped Road Users to Proceed**, the flagger **shall** face road users with the SLOW paddle face aimed toward road users in a stationary position with the arm extended horizontally away from the body. The flagger **shall** motion with the free hand for motorists to proceed.
- **To Alert or Slow Traffic**, the flagger **shall** face road users with the SLOW paddle face aimed toward road users in a stationary position with the arm extended horizontally away from the body.

To further alert or slow traffic, the flagger holding the SLOW paddle face toward road users **may** motion up and down with the free hand, palm down.

9.7 FLAGGING SITUATIONS

MUTCD 2000

Flagger Method of One-Lane, Two-Way Traffic Control

- When a one-lane, two-way temporary traffic control zone is short enough to allow a flagger to see traffic approaching from both directions, one flagger may be positioned opposite the obstruction/work space.
- When visibility of both ends of the traffic control zone cannot be maintained at all times, two or more flaggers should be used.

Flag Transfer Method of One-Lane, Two-Way Traffic Control

- The driver of the last vehicle proceeding into the one-lane section is given a red flag (or other token) and instructed to deliver it to the flagger at the

other end. The opposite flagger, upon receipt of the flag, then knows that it is safe to allow traffic to move in the other direction.

A variation of this method is to replace the use of a flag with an official pilot car that always follows the last road user vehicle proceeding through the section.

- **The flag transfer method should be employed only where the one-way traffic is confined to a relatively short length of a road, usually not more than 1 mile in length.**

Pilot Car Method of One-Lane, Two-Way Traffic Control

- A pilot car may be used to guide a Queue (group) of vehicles through the temporary traffic control zone or detour.
- **The operation of the pilot vehicle should be coordinated with flagging operations or other controls at each end of the one-lane section.** The pilot car should have the name of the contractor or contracting authority prominently displayed.
- **The PILOT CAR FOLLOW ME (G20-4) sign shall be mounted at a conspicuous location on the rear of the vehicle.**

If at any time during one-way, two lane operations either of the flaggers loses track of which direction has the right-of-way, or if a driver violates the signals of the flagger, all traffic should be stopped until the right-of-way is firmly reestablished.

Flagging in One Direction

Flagging may be required in one direction of traffic only, such as to facilitate loading or unloading of vehicles, and at points of entry to and exit from the work site. In these situations traffic may have to be stopped intermittently in one lane for short periods of time only. **The flagger should maintain a position on the shoulder or at the side of the roadway out of the direct paths of oncoming traffic,** and stop approaching vehicles in the usual manner. When the operation is completed and the road is clear of work vehicles, the STOP/SLOW paddle should be turned one quarter turn with the STOP message facing the flagger. In this position the sign paddle is parallel to the roadway and neither message is visible to motorists approaching from either direction.

Haul Road Crossings

At haul road crossings, temporary stoppage of all traffic may be accomplished by use of one or two flaggers, depending on traffic volumes, travel speeds, and sight distance. **The first vehicle shall be stopped by the flagger from the position on the shoulder or at the side of the road, and he or she should then move to the centerline of the roadway to stop additional approaching traffic.** When the area is clear of work vehicles the flagger should return to the shoulder or side of the road and release traffic in the usual manner.

Consideration should be given to controlling traffic at haul road crossings with temporary traffic signals rather than the use of flaggers. If signals are used for these purposes, they must meet the physical and operational requirements of conventional traffic signals as described in the MUTCD.

Special Flagging Situations

Flaggers are sometimes needed to advise motorists of specific conditions or hazards which may be encountered in a temporary traffic control zone, to control the speed of passing traffic, to protect workers involved in the installation or removal of traffic control devices, to protect survey crews working within the roadway, to assist during mobile operations, and in emergency situations. Individuals assigned to these duties should be fully advised as to the nature of the operation and the control strategy to be implemented. **The flagger should observe the principles discussed earlier in conjunction with proper positioning of flagger stations**

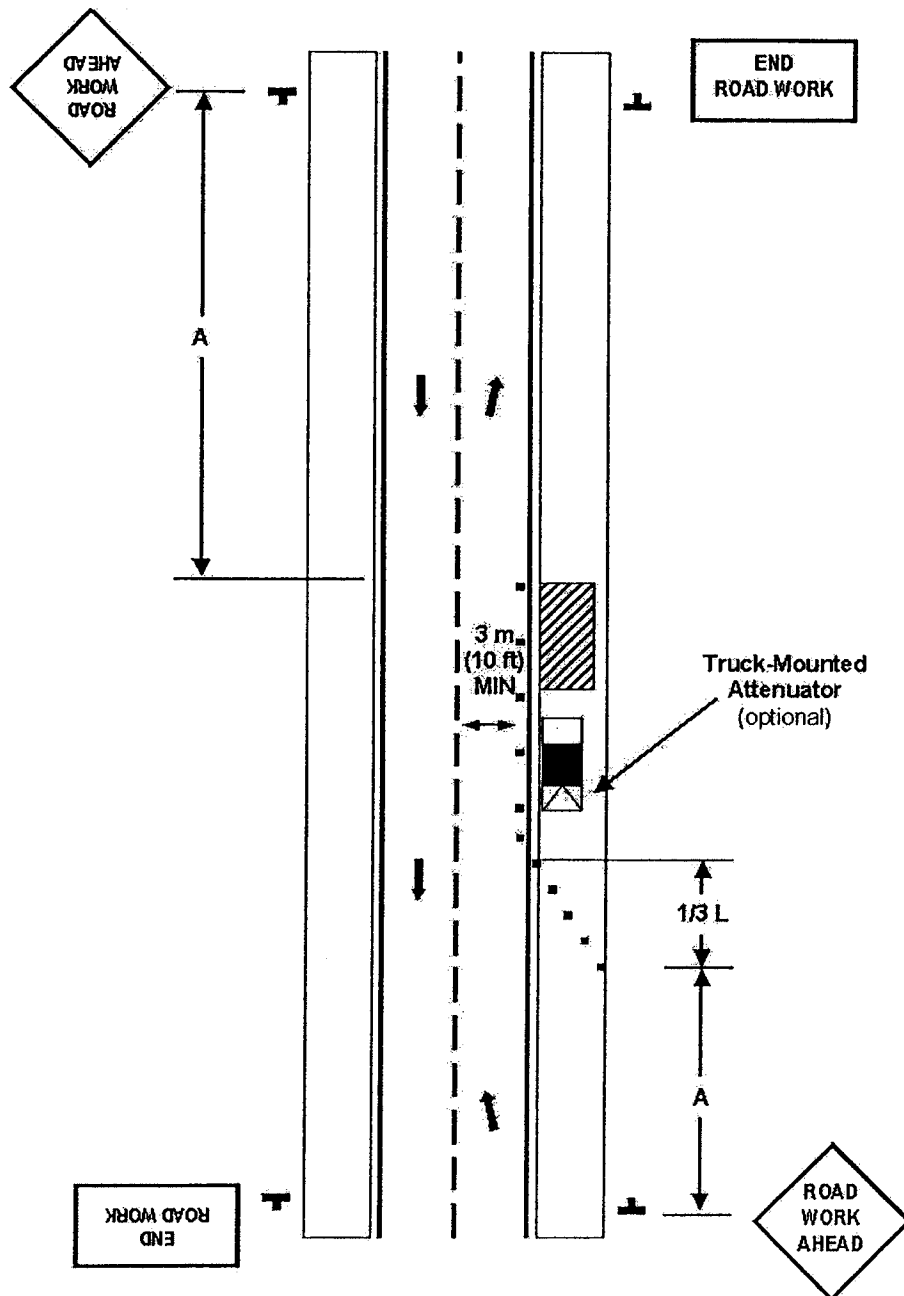
Long Term Operations

For long term stationary operations, the installation of **a temporary traffic signal is preferable** to a flagging operation. Issues such as flagger and driver safety, nighttime visibility, and cost-effectiveness suggest strong consideration be given to traffic signal usage

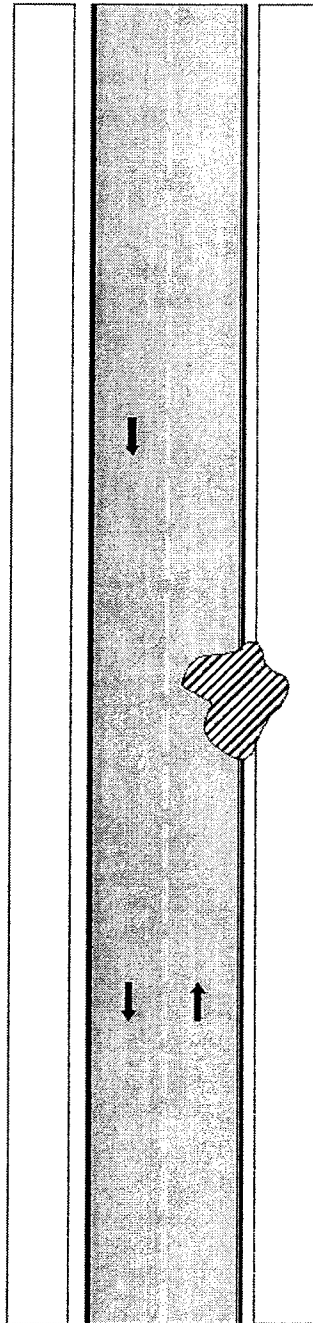
(see Figure 6H-12 and Chapter 4G of the MUTCD).

Exercise #2 - Identifying Special Requirements When Flaggers are Used

You are the TCS for the following work operation. You initially received this approved traffic control plan from the project TCM. However, unforeseen circumstances require that the work crew move their work 5 feet into the lane of traffic. On the next page, illustrate the changes in the traffic control plan you will recommend to the TCM to safely move motorists through the work zone. The speed limit is 35 MPH and the lane is 11 feet wide. The activity area is 100 feet long. The work operation is scheduled from 2pm to 9pm.



Exercise #2 - Worksheet



CHAPTER 10

INSTALLING AND REMOVING TRAFFIC CONTROL DEVICES

10.1 SUMMARY

This chapter discusses the process of installing and removing traffic control devices in temporary traffic control zones including preparation, the order of device installation, the treatment of existing signs, and the use of “shadow” or “protection” vehicles. Procedures for safely modifying, reinstalling, and moving traffic control devices are also discussed.

10.2 PREPARATION FOR INSTALLATION

The installation, modification, and removal of traffic control devices for highway - construction, maintenance, utility, and incident management operations can be enhanced by adequate preparation. This is particularly important because of the hazards associated with these activities. **Installation and removal of temporary traffic control zones create situations that are often far more hazardous than the operation of the completed zone.** These hazards are often greater than those during the work activity because:

- **Workers** placing advance warning signs and channelizing devices **must be in the roadway** at points of high conflict without the full protection of the devices being placed.
- **The placement operation constitutes an unexpected situation for motorists** as they are confronted with a roadway partially closed and a partial temporary traffic control zone.

The inherent danger of these operations can be lessened by using techniques that - emphasize safety. Also, to reduce the exposure, **the installation should be done as quickly as possible.** To this end, several elements must be considered before the installation of the traffic control zone is undertaken.

Coordination with Affected Groups

Prior to the installation of a temporary traffic control zone, the **planned activities and the starting times should be coordinated with all affected organizations and groups**, including the following:

- Police
- Traffic department
- Fire department
- Rescue department
- School system
- News media
- Businesses and industries
- Public transportation
- Residents

Planning the Installation

Analysis of the specific requirements for a given situation prior to the installation of the temporary traffic control zone **greatly improves the safety and efficiency of the installation.**

A visit to the site is often necessary to gain better familiarity with the roadway - geometrics and other conditions, which may not be indicated on project plans or in contract documents.

Inventory and Storage

A complete inventory, listing all required traffic control devices and equipment for all phases of the operation should be prepared.

All traffic devices required for the initial installation and subsequent maintenance of the temporary traffic control zone should be on-hand and in good condition. Also, special equipment, trailers, and trucks should all be operating properly and safely.

WSDOT, Standard Specifications

“The condition of Traffic Control Devices shall be new or 'acceptable' as defined in the book *Quality Standards for Work Zone Traffic Control Devices*.”

Devices maintained in inventory need to be formally organized to assure that all items are actually in stock and can be rapidly retrieved.

Traffic control devices need to be stored properly to avoid marring or otherwise damaging retroreflective surfaces, and all devices need to be kept clean.

- **Proper sign storage techniques are discussed in Chapter 5, section 5.4, page 7.**

All **mechanical and electrical elements and equipment require routine maintenance** to assure that they will function properly. It is important to maintain a readily accessible inventory of spare parts for control devices, signs, and mounting devices. The replacement of damaged devices after an incident or an accident or even after a routine inspection is much easier and faster if an inventory of spare parts is available.

Training and Instruction

All crew members should be trained for their tasks, with particular emphasis on safety. To ensure that all crew members know their installation assignments, are thoroughly familiar with the mechanical operation of special devices, and to assure an efficient and speedy operation, the supervisor should review the installation process with his/her crew before going into the field. If either a new or different procedure is to be used, or if new people are in the crew, these instructions are essential. In some cases, a rehearsal in the company yard, parking lot or, if available, on an abandoned segment of a roadway may be desirable.

Installation crews should be cautioned to always face oncoming traffic during the establishment, modification, and removal of temporary traffic control zones, and to prepare for emergencies by planning escape routes in advance.

10.3 INSTALLATION

Installation Sequence

Devices are installed in the direction that traffic moves — that is, moving “downstream.” The first device placed is the first advance warning sign. The installation then proceeds with the:

- Advance warning area,
- Transition area,
- Activity area, and
- Termination area.

If traffic in both directions will be affected, such as with work in the center lanes, the devices can be placed in both directions at the same time, starting at each end farthest from the activity area or work space. Alternately one direction can be installed before the other.

When one direction of traffic will be directed into opposing traffic lanes, such as Figures 6H-10, 6H-24, 6H-31, and 6H-39 in Chapter 6H, Part VI of the MUTCD, or when traffic in both directions must alternately operate in the same travel lane, the **signs, channelizing devices, and pavement markings for the opposing traffic should be placed first**. It is essential to channelize opposing traffic out of its lane before moving the oncoming traffic into the lane. When all signs and devices are placed for opposing traffic, the devices for the oncoming direction can then be set up.

When signs or channelizing devices are to be installed and removed several times during the work operation, a spot may be painted on the roadway surface to indicate where each device is located. This enables the crew to reinstall the devices quickly and properly.

The installation and removal sequences for detours are the opposite of that described above, because drivers must be given adequate guidance once they are instructed to divert to a detour roadway. Similarly, the first signs to be removed when the detour is no longer needed, are those which the motorist would normally encounter at the upstream terminus of the detour.

Drivers do not expect workers in the roadway setting up a temporary traffic control zone. Since the goal is to make the entire operation safe, **Flashing vehicle lights and special lighting devices should be used to warn motorists of the presence of workers**. It may be necessary to use temporary signs during the installation sequence to protect workers while they are installing the more permanent signs for a temporary traffic control zone. **Flashing arrow panels and TMAs are valuable to assist the workers during placement or removal of channelizing devices for lane closures**.

Installation Procedure

Work vehicles should be parked in a safe location to unload crews and devices, such as:

- Legally at curb
- On shoulder
- On side street

The work vehicle may serve as the advance warning device by using its flashing/rotating lights while the first warning signs are being placed. To protect the crew, the devices truck should be located upstream of the crew. This can be awkward, however, if the signs are unloaded from the rear of the truck.

On high-speed roads, a “shadow,” and/or “protection,” vehicle should be used. This vehicle should first be positioned on the shoulder some 100 feet or more behind the devices truck when the first signs are placed. The shadow vehicle should be equipped with special lights, a rotating dome light, and/or a flashing arrow display to alert and warn approaching traffic. When the crew needs to work on the roadway, the shadow vehicle is moved into the traveled lane. Truck mounted attenuators are desirable for these vehicles.

Placing Channelizing Devices

When closing a lane, tapers are laid out in a straight line starting at the shoulder. Each channelizing device is then placed in sequence moving downstream. When placed by hand, the **devices should be moved out from the shoulder with the worker looking toward traffic** as he /she moves into the lane to place the device.

Cone Placement

Cones may be placed either by workers on foot or from a moving vehicle. When working from a vehicle, the truck should be equipped with an approved worker platform and railing. On high-speed roadways, a shadow vehicle should be used to protect a worker who is working from the back of the truck.

Lateral Position

For some lane closures, traffic does not have to be excluded from the entire width of the lane to establish a safe work space. Under these circumstances, channelizing devices should be placed a few feet back from the lane line to:

- Reduce the chances of the devices being hit, and
- Provide increased lateral clearance, thereby increasing capacity.

The setback distance should not exceed 4 to 5 feet to preclude the use of this offset space as a travel lane.

Ballast

Traffic control devices may require ballast to prevent them from being displaced or blown over.

WSDOT, Standard Specifications

“If it is necessary to add weight to the sign for stability, only a bag of sand that will rupture on impact shall be used. The bag of sand shall: (1) be furnished by the Contractor, (2) have a maximum weight of 40 pounds, and (3) be suspended no more than 1 foot from the ground.”

In freezing weather, the sand should be protected from water penetration with a plastic bag. Cones may be weighted with rings which fit tightly over the base of the cone or they may be doubled to increase their stability. Cones may also be purchased which have 60 percent or more of their total weight in the base.

Lane Closures on Freeways and Expressways

Lane closures on multilane, unidirectional highways are of two types. “Exterior” lanes are those where the lane is bordered by a shoulder along one edge. “Interior” lanes, such as the center lane of a three-lane roadway, are bordered by travel lanes on both sides.

- **Exterior Lane Closures**

The lane is closed by having a protection vehicle along the shoulder or exterior lane, if no shoulder is available. The vehicle should be equipped with warning lights and a flashing arrow display. **The protection vehicle stops in a blocking position at least 100 feet upstream** while the first advance warning sign is placed. This operation is repeated for all warning signs — first for one side, then the other side of the roadway.

When all signs are in place, channelizing devices are placed. The protection vehicle gradually encroaches upon the exterior lane as workers install the taper in front of the protection vehicle. Finally the protection vehicle is positioned in the closed lane while the channelization for the activity area is installed.

- **Interior or Center Lane Closures**

When work is necessary on a interior or center lane, it is recommended to also close an adjacent exterior lane to avoid an “island” closure. Where, because of volumes or geometrics, traffic must be directed around both sides of a work space occupying an interior lane, it is preferred to reduce the number of travel lanes by closing an exterior lane upstream of the activity area and then to shift traffic back into the exterior lane around the work space. Part VI of the MUTCD, Section 6H, Figure 6H-38 illustrates this type of traffic control scheme, but the use of a flashing

double arrow display for high-speed conditions is highly controversial, because drivers are confused about which direction to drive.

The following procedure should be used for a center lane closure:

- Advance warning signs are placed on both sides of the approach roadway and the exterior lane is closed in the usual manner to create an “empty” work space.
- The protection vehicle, preferably equipped with a flashing arrow display and a TMA, moves to the downstream end of the closed exterior lane and blocks the adjacent center lane.
- The taper which moves traffic to the previously closed exterior lane is installed, and channelization for the closed center lane is established on both sides of the activity area.
- Required signing is placed in the closed center lane and the protection vehicle may be moved to a blocking position in the work space.
- In the final configuration, traffic is permitted to flow around both sides of the activity area.

10.4 REMOVAL

Removal Sequence

Temporary traffic control zones should be removed by picking up the devices in the reverse sequence to that used for installation. This requires moving backwards or upstream through the control zone. An alternate procedure, especially applicable where no suitable shoulders exist, is to remove the traffic control devices in the reverse order of installation and to temporarily place them on the side of the highway. The work vehicle then can travel in the downstream direction to collect the devices.

In a detour situation, the signs at the beginning of the detour should be removed first as soon as the original route is again open to traffic. The remainder of the detour signs/devices can then be removed.

Placement and removal of portable barriers requires special care and planning. - Frequently, the lane adjacent to the barrier must be closed temporarily while the barrier sections are installed. This operation should be scheduled to cause as little traffic disruption as possible.

MUTCD, 2000

“ All temporary traffic control devices shall be removed as soon as practical when they are no longer needed.”

“When work is suspended for short periods of time, temporary traffic control devices that are no longer appropriate shall be removed or covered.”

Where extensive modifications to the temporary traffic control zone are required, for example when switching a closure from one side of the roadway to the other, it may be necessary to remove the entire installation and then reinstall it in the new configuration.

Traffic control devices should be inspected carefully when they are returned to inventory, and those found to be nonstandard or in poor condition should be retired, modified, or repaired.

10.5 SPECIAL EQUIPMENT AND TECHNIQUES

Several highway agencies, contractors, and manufacturers have devised special - equipment to facilitate and expedite the installation process. One feature that is often found are racks in which signs are loaded in the reverse sequence to that needed in the field; that is, the last sign put on is the first one to be taken off.

Special traffic control vehicles should be available for temporary traffic control zone installation, maintenance, and removal. Such vehicles are also useful in emergency situations.

Cone Dispensers

Special cone chutes have been developed which permits cones to be placed on the roadway from a moving vehicle. This technique enables high-speed highway lanes to be closed quickly and safely.

When plastic drums or barricades are used on channelizing tapers for long-term - construction projects, cone dispensers may be used to install a temporary channelizing taper. The barricades or plastic drums are then installed inside the cones allowing adequate time for their erection and ballasting.

Exercise #3 - Traffic Control Device Inventory

Using the Traffic Control Plan you recommended to the TCM in Chapter 9, Exercise #2, develop a "Traffic Control Device Inventory".

List the number and types of all devices you will use to adequately set up the Traffic Control Zone.

Device	Quantity

CHAPTER 11

TCP MANAGEMENT AND EVALUATION

11.1 SUMMARY

This chapter will discuss the tasks and procedures involved in the management and evaluation of temporary traffic control zones. Topics to be addressed include the initial inspection of the traffic control plan, maintenance of the traffic control devices to assure their proper performance throughout the duration of a project, collection and analysis of accident and incident data, and modification of the TCP to correct problems or deficiencies.

11.2 TRAFFIC CONTROL PLANS

WSDOT, Standard Specifications M41-10

“The traffic control plan or plans appearing in the contract plans show a method of handling traffic. All flaggers are to be shown on the traffic control plan except for emergency situations. The Contractor shall designate and adopt in writing the specific traffic control plan or plans required for their method of performing the work. If the Contractor’s methods differ from the contract plan(s), the Contractor shall propose modification of the traffic control plan(s) by showing the necessary construction signs, flaggers, and other traffic control devices required for the project. The Contractor’s modified traffic control plan(s) shall be in accordance with the established standards for plan development as shown in the MUTCD, Part VI. The Contractor’s letter designating and adopting the specific traffic control plan(s) or any proposed modified plan(s) shall be submitted to the Engineer for approval at least ten calendar days in advance of the time the signs and other traffic control devices will be required.”

11.3 IMPLEMENTING THE TRAFFIC CONTROL PLAN

The Installation, Removal, Inventory, and Maintenance of traffic control devices is covered in Chapter 10.

Advanced Preparation

A good time to discuss inspection procedures is during the pre-construction conference. This discussion should identify:

- **The TCS who will perform the inspection;**

- **Who has the authority to make changes;**
- **Who can be called upon for assistance and expert advice; and**
- **The responsibilities of the contractor (TCM) during the inspection itself and in making changes to the plan and traffic control devices.**

On many projects, a large number of different traffic control plans may be needed during various phases and stages of operations. Each of these plans should be evaluated in the same manner as the initial plan as soon as they are implemented in the course of the work.

11.4 INITIAL INSPECTION OF TRAFFIC CONTROL PLAN

WSDOT, Standard Specifications M41-10

“The TCS’s duties shall include: --- Inspecting traffic control devices and nighttime lighting for proper location, installation, message, cleanliness, and effect on the traveling public.”

“Traffic control devices left in place for 24 hours or more should also be inspected once during the nonworking hours when they are initially set up during daylight or darkness, whichever is opposite of the working hours.”

A newly implemented temporary traffic control plan may not operate as well as it was designed to operate. To lessen potential hazards to motorists and workers, **traffic control plans should be inspected and evaluated immediately after they have been implemented** to determine if changes are needed. The information obtained during the initial inspection of the work zone may disclose deficiencies and operational problems which indicate potential hazards and can be corrected before any accidents occur.

During the initial inspection the following should be reviewed:

1. Field installations of devices should be compared with the plans and specifications to assure that the proper devices have been installed at the correct locations.
2. Message content of signs should be reviewed to see if they communicate the proper information to the motorist.
3. At all transitions, the location of the tapers, their lengths, channelizing device type and spacing should be checked and evaluated for proper operation.

4. Any existing signs, traffic signals, and other permanent traffic control devices, which are not needed or are in conflict with the temporary traffic controls, should have been removed or covered.
5. Temporary pavement markings should have been applied and permanent markings completely removed if required by the traffic control plan.
6. Verify that proper protection has been installed through the activity area to separate the buffer and work spaces from the traffic space and that a clear travel path has been defined for motorists.
7. If flaggers are used, their appearance, equipment, flagging techniques, and location should be checked for correct practices.
8. A determination should be made whether the work zone can safely and efficiently be operated without flaggers. If so, flaggers need not be exposed to the hazards associated with this type of operation.
9. Workers in the immediate vicinity of the traveled way should be properly equipped with safety vests or clothing, and instructed to avoid unnecessary exposure to traffic.
10. Work vehicles should be parked away from traffic so as not to create an unnecessary fixed hazard.

The initial inspection should also include a night visit to the temporary traffic control zone.

11. The system of control devices should be checked to determine if they properly delineate the traffic path through the work zone.
12. Signs which are not needed after the workday has ended should be covered, turned or laid flat.
13. Warning lights should be operating in the proper mode and retroreflective materials on signs and channelizing devices should be clean and bright.
14. Temporary pavement markings should be in good condition and clearly delineate the travel path, and unwanted permanent markings should have been completely removed so motorists will not be misled.

Modifications to the Traffic Control Plan

WSDOT, Standard Specifications M41-10

- If problems are apparent, “**the TCS may make minor revisions to the approved traffic control plan to accommodate site condition,**”

- If major revisions are needed, the TCS should refer recommendations to the TCM and/or the WSDOT TCS for resolution

“The TCS’s duties shall include: --- Ensuring that corrections are made if traffic control devices are not functioning as required. The TCS may make minor revisions to the traffic control plan to accommodate site conditions as long as the original intent of the traffic control plan is maintained and the revision has concurrence of the WSDOT TCS.

11.5 MAINTENANCE

Maintenance Inspections

Once a temporary traffic control zone has been established, it must be maintained so that it will function as effectively as when initially installed.

Periodic review of traffic control devices is necessary to assure that they are performing satisfactorily, that their condition and retroreflectivity is adequate, and that they have not been moved, damaged or otherwise rendered ineffective.

WSDOT, Standard Specifications M41-10

“The TCS’s duties shall include: Inspecting traffic control devices and nighttime lighting for proper location, installation, message, cleanliness, and effect on the traveling public.”

“The condition of signs and traffic control devices shall be new or ‘acceptable’ as defined in the book *Quality Standards for Work Zone Traffic Control Devices*, and will be accepted based on a visual inspection by the Engineer. The Engineer’s decision on the condition of a sign or traffic control device shall be final. When a sign or traffic control device becomes classified as ‘not acceptable’ it shall be removed from the project and replaced within 12 hours.”

Periodic maintenance of traffic control devices is needed to service equipment and take corrective actions as the result of any combination of the following factors or events:

- Traffic accidents.
- Device displacement due to:
 - Vehicular contact.
 - Work activities.

- Slip stream from trucks.
- Wind or storms.
- Worker actions.
- Damage caused by construction activities.
- Weather damage.
- Equipment malfunction and bulb burnouts.
- Spent fuel or batteries.
- Physical deterioration.
- Road dust, dirt, grime, splatter, etc.
- Vandalism.
- Vegetation growth.
- Improper sign covers.
- Abrasion of pavement markings.

Inspection Frequency

WSDOT, Standard Specifications M41-10

“Traffic control devices shall be inspected each work shift except that Class A signs and nighttime lighting need to be checked only once a week.”

Traffic control devices may need to be inspected more often. The following factors must be considered in determining the frequency of inspection of the traffic control installation:

- **Project size and duration.**
- **Traffic volumes and speed.**
- **Severity of the hazards.**
- **Frequency at which damage is occurring.**

Provisions should also be made to inspect the temporary traffic control zone when no active construction activities are underway. This would include periods when work is temporarily suspended, but the work zone remains in place, such as during weekends and holidays. Especially critical are weekends which also include a holiday because of typically higher recreational traffic volumes during these periods and the increased exposure of the temporary control devices to traffic.

Drive-Through Inspection

One way of performing an inspection is to drive through the work zone and observe motorists traveling through the area. The drive-through inspection **enables the observer to see the traffic control devices from the perspective of the motorist** and to perform the maneuvers required of other drivers. This type of inspection should be conducted in all lanes and in both directions, on crossroads, from all entry and exit points within the control zone, and during day and night. Any other routes, such as detours and temporary diversions, should also be driven.

11.6 DOCUMENTATION

Documentation is an essential part of the traffic control function. It is necessary for good planning and project accounting, and essential in instances of legal action.

Daily Traffic Control Diary

WSDOT, Standard Specifications M41-10

“The TCS’s duties shall include: ---Preparing a daily traffic control diary on DOT Forms 421-040A and 421-040B, which shall be submitted to the Engineer no later than the end of the next working day to become a part of the project records. The Contractor may use their own form if it is approved by the Engineer....”

Reports should include information about the control devices used on the project, how their arrangement permits traffic to flow, and any changes which were made to the traffic control plan.

A good technique for documenting the immediate thoughts and observations of the person performing the inspection is to use a portable tape recorder. Photographs, time-lapse camera, photo-logging, and videotaping have been used to capture the driver’s perspective of the temporary traffic control zone and to create a permanent record of the completed installation. It is important that all such pictures and recordings be keyed to the project by station or milepost, and that these records be dated and identify the person who performed the inspection.

These periodic inspections must be documented. In the event of lawsuits resulting from accidents in a work zone, or if complaints and grievances are filed by injured or inconvenienced roadway users. The work zone traffic control can then be reconstructed

Documentation serves to:

- **Ensure the integrity of the project traffic control.**
- **Provides a means of:**
 - **Identifying the changes/maintenance needed,**
 - **Providing a tool for getting changes/maintenance started,**
 - **Checking to see that changes/maintenance is done, and**
 - **Documenting that changes/maintenance was done.**

Daily Diary Content

Documentation should include:

- 1. Starting and ending time of work.**

- 2. Time and location of installation and removal of traffic control.**
- 3. Location of work.**
- 4. Revisions to the traffic control plan.**
- 5. Names of personnel.**
- 6. Type of equipment used.**
- 7. Lighting utilized at night**
- 8. Changes in temporary or permanent regulatory devices.**
- 9. Observations of traffic conditions.**

Several methods of recording traffic controls are available. These include:

- **Photographs** either keyed to a diary or containing a brief description of:
 - Time.
 - Location.
 - Direction.
 - Photographer's name.
- **Videotaping** of work zone drive-through can also be used to document the placement and condition of traffic control devices.
- **Special notes on construction plans** (preferably the traffic control plan sheet).
- **Diary entries** of times, location, and names of individuals (when known) involved in the:
 - Installation.
 - Modification.
 - Removal of traffic control devices.

When the inspection process reveals a condition that requires correction, the documentation should include:

- **Description of the correction needed, when it was noted, and by whom,**

- **Corrections made or deferred and why,**
- **Replacements made or deferred and why, and**
- **Any other needed actions.**

Daily Diary Forms 421-040A and 421-040B Preparation

Note: The completion of these forms is self explanatory

DOT forms 421-040A

**Washington State
Department of Transportation**

Contractor's Daily Report of Traffic Control - Summary

Page One

Contract Number _____ SR Number _____ Day _____ Date _____

Photos/Videos taken today for record? ☐ Yes ☐ No

If yes, note locations:

Summary of TCS Activities:

[illegible]

Contractor

Contractor's Traffic Control Supervisor's Signature

WSDOT Project Office
Comments:

To be Completed by Contractor's Traffic Control Supervisor (TCS)

DOT Form 421-040A
2/04

Distribution: White - Contractor Canary - Project Engineer

DOT forms 421-040B



Washington State
Department of Transportation

Contractor's Daily Report of Traffic Control - Traffic Control Log

Use Separate Sheet for Each Setup
(May be altered to record Class A signs.)

Page _____

Contract Number _____ SR Number _____ Day _____ Date _____

Setup			
	Station	Time	
◇	—		◇
◇	—		◇
◇	—		◇
◇	—		◇
◇	—		◇

Work Area

◇	—		◇
◇	—		◇
◇	—		◇
◇	—		◇
◇	—		◇

↑ One Way Traffic
(one or more lanes)

↓ Two Way Traffic
(two or more lanes)

Legend	
(List of Signs Used)	
◇ 1	_____
◇ 2	_____
◇ 3	_____
◇ 4	_____
◇ 5	_____
◇ 6	_____
◇ 7	_____
◇ 8	_____

Cones ☐ Yes ☐ No

Piloted ☐ Yes ☐ No

Per Approved Plan ☐ Yes ☐ No

Flagger(s)	Start	End

Contractor

Contractor's Traffic Control Supervisor's Signature

Type of Traffic Control	Time Set Up	Time(s) Checked	Time Removed

To be Completed by Contractor's Traffic Control Supervisor (TCS)

DOT Form 421-040B
Revised 10/96

Distribution: White - Contractor; Canary - Project Engineer

EXERCISE #4 - Preparing Daily TC Diary

During your initial drive through inspection of the traffic control zone from Chapter 9, you found the following deficiencies:

1. The north bound "FLAGGER AHEAD" sign was lying flat on the ground.
2. There were two cones out for place in the tangent.
3. The south bound flagger was flagging traffic from the center of the active south bound lane.

Using the DOT Form 421-040A on the next page, document all observations during your drive through inspection and include any corrective action taken.

DOT forms 421-040A



**Washington State
Department of Transportation**

Contractor's Daily Report of Traffic Control - Summary

Page One

Contract Number _____ SR Number _____ Day _____ Date _____

Photos/Videos taken today for record? ☐ Yes ☐ No

If yes, note locations:

Summary of TCS Activities:

[illegible]

Contractor

Contractor's Traffic Control Supervisor's Signature

WSDOT Project Office
Comments:

To be Completed by Contractor's Traffic Control Supervisor (TCS)

DOT Form 421-040A
2/94

Distribution: White - Contractor Canary - Project Engineer

11.7 WORK ZONE ACCIDENTS

The **Federal Code of Regulations** 23 CFR Part 630, Subpart J, also contains language requiring that “*construction zone accidents shall be analyzed*” and used to continually correct deficiencies which are found to exist on individual projects, and to improve the content of future traffic control plans.

Accident Reports

Work zone accident data can be recorded in the TCS’s daily traffic control inspection report or on a special accident report form.

The purpose of the accident report form is to record information about the accident and the work zone traffic control existing at the time of the accident.

The accident investigation conducted by the project manager should focus on the status of the traffic controls at the time of the accident. All traffic controls should be shown in the accident diagram section of the accident report form including advance signing, flaggers, or police vehicles. (It may be possible to refer to either photographs or a traffic control plan if traffic controls are extensive.) The accident diagram will show the paths of vehicles involved and their relationship to the work activity and the work area traffic controls.

The accident narrative describes what happened in the accident, with emphasis on; the involvement of the work activity at the time of the accident; any problems observed in the work area traffic control devices; and comments of the investigating officer and witnesses. Information about the condition of traffic control devices or confirmation of the presence of specified devices should be included.

Additionally, the report must document actions which were taken by project personnel to identify and/or correct problems and hazards associated with the temporary traffic control layout, if any.

Accident Analysis

Accidents are the most serious indication of work zone traffic control problems. When one occurs, **all possible steps should be taken to determine its cause and to make corrections that will reduce the probability of additional accidents.**

When an accident occurs within the project limits, however, it does not automatically mean that a change in work zone traffic controls is required. Accidents are a statistically rare occurrence, the cause of any one accident can be very hard to determine, and most accidents usually are the result of a combination of factors.

The first step in determining the cause is to examine the relationship of the accident to the existing work zone traffic controls. If there appears to be a connection, the problem can be further examined by collecting conflict data or other data on work zone traffic operations that might be helpful, such as, accident data on the roadway before the work project started. If accidents in the project area have increased significantly since the work zone was established, and if there are significant differences between the types of accidents during the work activity and the types before the work began, the problem is probably associated with the work zone traffic control or the work activity.

The analysis of a set of accident data should include classifying the accidents and finding which classifications occur most frequently. Accidents are most commonly classified by location; accident type; time of day; weather; light; road surface conditions; and severity.

The location of the accident can be classified as at an intersection or at another location in the work zone. For many work zones, particularly stationary ones, the location of accidents can be specified by the area of the work zone. It is important to classify accidents by work zone areas because of the varying traffic control requirements in each area based on driver responses required for safe operation.

Also, any special circumstances or driver comments about the accident should be noted, such as “accident occurred during period of traffic backup” or “driver did not perceive lane closure early enough to merge into open lane.”

Incident Data

The collection of incident data **can be useful** either to support the accident data or **to point out a hazardous condition before an accident occurs**. Incident information should be recorded so it can be used by more than one person, can be referred to later, and can be used as a record of past conditions.

Like accidents, **incidents should be recorded in the TCS's daily traffic control inspection reports, or on special incident report forms.**

Record basic information about the incident, including the apparent paths of the vehicles involved in the incident or to show the location of damaged channelizing devices, skid marks, debris, etc.

Document any traffic control changes or other actions taken. If, for example, the locations of some advance warning signs were changed because of incidents in the transition area, the reasons for the changes should be documented. The reasons for not changing the locations of the other advance warning signs should also be documented.

Analysis of Other Data

In addition to accidents and incidents, the analysis of other data may also be needed to supplement accident and incident data. The kinds of data that are used to supplement accident and incident data include **traffic volumes, speed data, and plans and photographs.**

Project and Statewide Summaries

The work zone accident data process has two objectives:

1. To promote immediate analysis of work zone accidents and incidents by project managers.
2. To develop a database for statewide analysis of work zone accidents. Data should be sent by the project manager to the district traffic engineer (or, alternatively, to the district construction or maintenance section or utility company) and used to analyze project accident experience.

11.8 MODIFICATIONS

Problem Identification and Correction

When the analysis of accident, incident, and other data indicates that a problem with the temporary traffic control arrangement exists, and when patterns for these problems have been determined, changes in the control strategy may be required. **Tables 15-2, 15-3, and 15-4 are designed to provide for the identification of possible safety and operational problems and the corresponding traffic control changes which may be appropriate to correct the condition.** Problems and the suggested corrective measures are classified by the following indicators:

- Location of problem.
- Accident type.
- Time-of-day or weather conditions.

TABLE 15-2
PROBLEM IDENTIFICATION AND CORRECTION BY LOCATION OF PROBLEM

Location	Possible Problem	Possible Traffic Control Change
1. Accidents or incidents in the warning or approach area of the work zone.	Insufficient advance warning signs.	<ul style="list-style-type: none"> • Add warning signs • Increase size of advance warning signs • Use variable message signs or arrow board
	Speeds too high or high variance in speeds.	<ul style="list-style-type: none"> • Add advisory speed signs • Provide speed enforcement patrols • Install rumble strips
	Improper flagging technique	<ul style="list-style-type: none"> • Train flaggers • Move flaggers upstream • Replace flaggers with signals
	Insufficient work zone traffic capacity	<ul style="list-style-type: none"> • Provide alternate routes • Increase capacity by routing traffic onto shoulder • Change work schedule to exclude peak traffic periods
	Signs not visible at night	<ul style="list-style-type: none"> • Mount signs at correct height above roadway • Install flashing warning lights or signs • Replace signs not meeting visibility requirements • Illuminate signs
	Improper lane changes	<ul style="list-style-type: none"> • Add arrow board • Lengthen taper • Move taper position upstream
2. Accidents or incidents occurring in the transition area of the work zone	Insufficient advance warning	<ul style="list-style-type: none"> • Add advance warning signs • Increase size of advance warning signs • Move taper upstream to increase sight distance • Use variable message sign or arrow boards.
	Lack of sufficient sight distance to taper	<ul style="list-style-type: none"> • Move taper upstream to increase sight distance
	Improper merging at lane closures	<ul style="list-style-type: none"> • Add arrow board • Move taper upstream to increase sight distance • Lengthen taper
	Insufficient work zone capacity	<ul style="list-style-type: none"> • Provide alternate routes • Increase capacity by routing traffic onto shoulder • Change work schedule to exclude peak traffic periods
	Transition not visible at night	<ul style="list-style-type: none"> • Illuminate or reflectorized channelizing devices. • Add arrow board • Add temporary pavement markers
	Speeds too high or high variance in speeds	<ul style="list-style-type: none"> • Provide speed enforcement patrols • Install rumble strips • Add advisory speed signs
	Advance warning signs too far upstream from transition	<ul style="list-style-type: none"> • Move warning signs more frequently
3. Accidents or incidents occurring on curves.	Inadequate design for prevailing vehicle speeds	<ul style="list-style-type: none"> • Improving curve design • Improving edge line delineation • Add advisory speed plates

TABLE 15-2 (CONTINUED)
PROBLEM IDENTIFICATION AND CORRECTION BY LOCATION OF PROBLEM

Location	Possible Problem	Possible Traffic Control Change
4. Accidents or incidents occurring in the work area of the work zone.	Workers or equipment too near traffic stream	<ul style="list-style-type: none"> • Move equipment • Add portable concrete barriers • Instruct workers to wear hard hats and safety vest • Instruct workers to stay as far as possible from traffic stream • Install Highway Advisory Radio
	Motorists watching work activity	<ul style="list-style-type: none"> • Install sight barriers
	Speeds too high or high variance in speeds	<ul style="list-style-type: none"> • Install rumble strips • Provide speed enforcement patrols • Add advisory speed signs
	Access and egress of work vehicles into traffic stream	<ul style="list-style-type: none"> • Relocate work vehicle access and egress points. • Furnish Flaggers
	Insufficient work zone traffic capacity	<ul style="list-style-type: none"> • Provide alternate routes • Increase capacity by routing onto shoulder • Change work schedule to exclude peak traffic periods • Install Highway Advisory Radio • Reduce length of work area
5. Accidents or incidents on two-lane, two-way traffic operations on divided highways	Passing in no-passing zone	<ul style="list-style-type: none"> • Reduce length of section • Provide police enforcement • Provide cones or tubes on centerline of two-way section • Provide concrete median barriers • Change to alternate type of work zone such as bypass roadway or detour • Use variable message signs
	Insufficient work zone traffic capacity	<ul style="list-style-type: none"> • Provide alternate routes • Build bypass roadway • Widen lanes
6. Accidents or incidents on one lane sections with alternating direction traffic operations.	Excessive vehicle queues and delays	<ul style="list-style-type: none"> • Reduce length of section • Provide pace vehicle
	Improper flagging technique	<ul style="list-style-type: none"> • Train flaggers • Move flaggers upstream • Replace flagger with signal
7. Accidents or incidents occurring at median crossovers	Insufficient crossover delineation	<ul style="list-style-type: none"> • Remove old pavement markings • Install new pavement markings • Install raised pavement markers • Install lights on channelizing devices
	Speeds too high or high variance in speeds	<ul style="list-style-type: none"> • Provide speed enforcement patrols • Improve crossover design • Add advisory speed signs • Install rumble strips
	Shifting of cargo loads in trucks	<ul style="list-style-type: none"> • Improve crossover design • Provide speed enforcement patrols • Add advisory speed signs

TABLE 15-3
PROBLEM IDENTIFICATION AND CORRECTION BY ACCIDENT TYPE

Accident Type	Possible Problem	Possible Traffic Control Change
1. Fixed object accidents	Narrow work zone roadway	<ul style="list-style-type: none"> • Widen roadway by moving channelizing devices or by using narrower devices • Improve reflectivity and delineation of devices • Illuminate or reflectorized channelizing devices • Increase roadway width by routing traffic onto the shoulder
	Insufficient advance warning	<ul style="list-style-type: none"> • Move taper upstream to increase sight distance • Add arrow board
	Drums rolling into travel lane	<ul style="list-style-type: none"> • Replace drums with barricades • Increase traffic control device inspections frequency
	Too many traffic control devices in or near roadway	<ul style="list-style-type: none"> • Provide portable concrete median barriers • Increase spacing between devices
2. Pedestrian accidents or incidents involving pedestrians	Pedestrians on the roadway	<ul style="list-style-type: none"> • Build separate walkway • Install barriers between pedestrians and traffic • Restrict pedestrian movements
	Workers in or near traffic	<ul style="list-style-type: none"> • Install barriers between pedestrians and traffic
3. Truck accidents or incidents involving trucks	Speeds too high or high variance in speeds	<ul style="list-style-type: none"> • Increase design speeds • Provide speed enforcement patrols • Add advisory speed plates • Add ruble strips • Use variable message signs
	Work zone roadway too narrow for large vehicles	<ul style="list-style-type: none"> • Provide truck detours • Widen work zone roadway
	Inadequate work zone pavement thickness to support large vehicles	<ul style="list-style-type: none"> • Provide truck detours • Increase pavement strength
	Low truck speeds on grades	<ul style="list-style-type: none"> • Provide climbing lanes • Provide Truck detours
4. Head-on accidents or passing conflicts	Divide highway with tow-way traffic operations	<ul style="list-style-type: none"> • Install Median barriers • Use alternate type of work zone. • Shorten length of two-way traffic operation • Install channelizing devices on center line
	Slow-moving maintenance operations	<ul style="list-style-type: none"> • Require work train to allow vehicles to pass occasionally • Improve signing and lighting on work vehicle • Change work schedule to periods o lower traffic volume

TABLE 15-3 (CONTINUED)
PROBLEM IDENTIFICATION AND CORRECTION BY ACCIDENT TYPE

Accident Type	Possible Problem	Possible Traffic Control Change
5. Rear - End accidents or slow-moving vehicle conflicts	Insufficient work zone traffic capacity	<ul style="list-style-type: none"> • Provide alternate route • Change work schedule to exclude peak traffic periods • Increase capacity by routing traffic onto shoulder • Reduce length of work area • Install Warning signs
	Poor work vehicle access or egress to traffic stream	<ul style="list-style-type: none"> • Change work vehicle access or egress points • Provide flagger
	Improper flagging technique	<ul style="list-style-type: none"> • Train flaggers • Move flagger upstream • Replace flagger with signals • Provide extra flagger positioned near the upstream end of vehicle queue
	High variance in vehicle speeds	<ul style="list-style-type: none"> • Provide reasonable speed limits • Provide speed enforcement patrols
6. Sideswipe same direction accidents, merging accidents and lane change or slow-to-merge conflicts	Insufficient taper length	<ul style="list-style-type: none"> • Lengthen taper • Add arrow board • Position arrow board near start of taper • Move taper upstream to increase sign distance
	Insufficient acceleration lane length	<ul style="list-style-type: none"> • Lengthen taper • Install yield or stop signs on on-ramp • Close on-ramp • Build temporary ramp downstream
	Incorrect taper placement	<ul style="list-style-type: none"> • Move taper upstream to increase sight distance • Add arrow board • Position arrow board near start of taper
8. Run-off-road	Narrow roadway	<ul style="list-style-type: none"> • Widen roadway • Provide speed enforcement patrols • Improve edge line delineation

TABLE 15-4
PROBLEM IDENTIFICATION AND CORRECTION BY TIME-OF-
DAY/WEATHER CONDITIONS

Time/Weather	Possible Problem	Possible Traffic Control Change
1. Night Accidents	Poor visibility or delineation	<ul style="list-style-type: none"> • Illuminate or reflectors channeling devices • Remove old pavement markings • Add temporary pavement markers • Add temporary pavement edge lines • Add arrow board
	Equipment of vehicles stored near roadway	<ul style="list-style-type: none"> • Store vehicle and equipment at location away from roadway
2. Accidents or incidents during periods of peak traffic volume	Insufficient work zone traffic capacity	<ul style="list-style-type: none"> • Provide alternate routes • Increase capacity by routing traffic onto shoulder • Change work schedule to exclude peak traffic periods • Change work zone type
	Access and egress of work vehicles into traffic stream	<ul style="list-style-type: none"> • Relocate work vehicle access and egress points • Furnish flaggers
3. Accidents or incidents during weekend periods	Vandalized or stolen traffic control devices	<ul style="list-style-type: none"> • Furnish night watchman • Increase police patrols
	Trucks or recreational vehicles unable to negotiate curves	<ul style="list-style-type: none"> • Redesign work zone using higher design speed • Broadcast warning messages via commercial or citizen band radio • Lengthen tapers
4. Accidents or incidents during inclement weather	Poor visibility or delineation	<ul style="list-style-type: none"> • Remove old pavement markings and replace with new pavement markings • Install raised pavement markers
	Poor drainage	<ul style="list-style-type: none"> • Improve superelevation • Patch low pavement areas • Prevent mud from washing onto roadway

Implementation of Corrective Action

When making corrective changes, the work team usually will start at the upstream end of the work zone. A device should not be moved from its original position to the new location if an additional hazard will be created by the absence of the device. For example, if the project engineer decides to move the entire set of advance warning signs upstream of a horizontal curve to improve sight distance, the best way is to install a new set of signs before removing the original signs.

In changing the location of a lane taper, the new taper should always be made fully operational before the existing taper and related traffic controls are removed. Taper refers to the cones, pavement markings, and/or barricades used to physically define the boundary of a lane closure. Depending on the location of the new taper, the advance warning signs also may have to be moved. If the taper is moved upstream, the signing may not provide adequate warning time and distance. Downstream moves may leave such a large gap between the advance warning signs and the activity area that motorists either forget that they are approaching a work space or else lose respect for signing that appears to be needless. In either case, the motorists could be surprised to discover that they are required to maneuver their vehicle through an activity area. Therefore, signing changes as discussed above should usually precede changes in the lane taper.

Corrective actions should be implemented as soon as possible; however, trade-offs between leaving the existing hazard and creating a new hazard by making the change under adverse traffic conditions must be considered. For example, if a change to alleviate rush hour congestion is needed, should motorists suffer through another day of congestion and possible rear-end accidents, or should the team try to make an immediate change? The presence of the team making the change may be more hazardous than the congestion. Maybe the change is best implemented during an off-peak period.

Of course, each work zone is different and will have to be analyzed individually. Every corrective traffic control change must be justified, planned, carefully implemented, and documented to avoid creating additional hazards.

The procedures expected of the contractor in performing corrective traffic control changes should be detailed in the contract and in the traffic control plan. More than likely, the meaning of these procedures will need to be discussed. The time to iron out all problems that could arise from misinterpreting these procedures is at the preconstruction conference.

Procedures for payment of changes to the Traffic Control Plan, must be defined in the contract document. Suitable force account procedures may be utilized for traffic control items. The lump sum method of payment should be used only to cover very small projects, projects of short duration, contingency, and general items. Payment for traffic control items as incidental to other items of work should be discouraged.

Documenting Changes

All traffic control changes should be documented. As a minimum, documentation should include:

- what was changed,
- when it was changed,
- why it was changed, and
- who changed it.

Traffic control plans should be updated to reflect existing conditions. Any standards or specifications that were followed as well as instructions to contractors should be noted in the project diary. Photography is also a good way to record the physical details of a traffic control change.

Evaluating Changes

All traffic control changes should be evaluated to ensure that the corrections are producing the desired results.

After implementing a corrective action, the TCS should inspect and evaluate the change to ensure that traffic flow and work zone safety have not been degraded. A minor change, such as relocating one sign, may require only a drive-through inspection to see that the sign has the correct message, is in the desired location, and is properly positioned toward oncoming traffic. A moderate or major traffic control change will require a more detailed investigation.

Workshop # 2 – Traffic Control Plan Modifications

You and your co-worker have just received word that due to an unforeseen change in traffic volumes the Project Manager has changed the work hours on your project from 8:00 AM to 5:00PM daily, to 5:00PM to 8:00AM nightly. This is to accommodate an increase in traffic volumes through the traffic control zone during daylight hours. Also, several accidents have occurred in the transition area at the shifting taper.

During your drive through inspections you have observed drivers entering the work zone at higher than expected speeds.

Use the same Traffic Control Plan (TC8) used in Workshop # 1. Note all modifications you would implement to deal with the changing conditions in the traffic control zone.

Standard Specifications

for Road, Bridge and Municipal Construction

2002

English Units

(section 1-10 Temporary Traffic Control)

M 41-10



Washington State Department of Transportation

1-10 TEMPORARY TRAFFIC CONTROL**1-10.1 General**

The Contractor shall provide flaggers, signs, and other traffic control devices not otherwise specified as being furnished by the Contracting Agency. The Contractor shall erect and maintain all construction signs, warning signs, detour signs, and other traffic control devices necessary to warn and protect the public at all times from injury or damage as a result of the Contractor's operations which may occur on highways, roads, or streets. No work shall be done on or adjacent to the roadway until all necessary signs and traffic control devices are in place.

These flaggers, signs, and other traffic control devices shall be used for the safety of the public, the Contractor's employees, and Contracting Agency's personnel and to facilitate the movement of the traveling public. They may be used for the separation or merging of public and construction traffic when in accordance with a specific approved traffic control plan.

Upon failure of the Contractor to immediately provide flaggers; erect, maintain, and remove signs; or provide, erect, maintain, and remove other traffic control devices when ordered to do so by the Engineer, the Contracting Agency may, without further notice to the Contractor or the Surety, perform any of the above and deduct all of the costs from the Contractor's payments.

The Contractor shall be responsible for providing adequate flaggers, signs, and other traffic control devices for the protection of the work and the public at all times regardless of whether or not the flaggers, signs, and other traffic control devices are ordered by the Engineer, furnished by the Contracting Agency, or paid for by the Contracting Agency. The Contractor shall be liable for injuries and damages to persons and property suffered by reason of the Contractor's operations or any negligence in connection therewith.

1-10.2 Traffic Control Management**1-10.2(1) General**

The Contractor shall designate an individual or individuals to perform the duties of Traffic Control Manager (TCM) and Traffic Control Supervisor (TCS). The TCM and TCS shall be certified as a worksite traffic control supervisor by one of the organizations listed in the Special Provisions. A TCM and TCS are required on all projects that have traffic control. The TCM can also perform the duties of the TCS. The Contractor shall identify an alternate TCM and TCS that can assume the duties of the assigned or primary TCM and TCS in the event of that person's inability to perform. Such alternates shall be adequately trained and certified to the same degree as the primary TCM and TCS.

The Contractor shall maintain 24-hour telephone numbers at which the TCM and TCS can be contacted and be available upon the Engineer's request at other than normal working hours. The TCM and TCS shall have the appropriate personnel, equipment, and material available at all times in order to expeditiously correct any deficiency in the traffic control system.

1-10.2(1)A Traffic Control Manager

The duties of the Traffic Control Manager shall include:

1. Discussing proposed traffic control measures and coordinating implementation of the Contractor-adopted traffic control plan(s) with the Engineer.

1-10.2(2) Traffic Control Plans

The traffic control plan or plans appearing in the contract plans show a method of handling traffic. All flaggers are to be shown on the traffic control plan except for emergency situations. The Contractor shall designate and adopt in writing the specific traffic control plan or plans required for their method of performing the work. If the Contractor's methods differ from the contract traffic control plan(s), the Contractor shall propose modification of the traffic control plan(s) by showing the necessary construction signs, flaggers, and other traffic control devices required for the project. The Contractor's modified traffic control plan(s) shall be in accordance with the established standards for plan development as shown in the MUTCD, Part VI. The Contractor's letter designating and adopting the specific traffic control plan(s) or any proposed modified plan(s) shall be submitted to the Engineer for approval at least ten calendar days in advance of the time the signs and other traffic control devices will be required.

1-10.2(3) Conformance to Established Standards

Flagging, signs, and all other traffic control devices furnished or provided shall conform to the standards established in the latest adopted edition of the *"Manual on Uniform Traffic Control Devices"* (MUTCD) published by the U.S. Department of Transportation and the Modifications to the MUTCD for Streets and Highways for the State of Washington. Copies of the MUTCD may be purchased from the Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. 20402. Modifications to the MUTCD for Streets and Highways for the State of Washington may be obtained from the Department of Transportation, Olympia, Washington 98504.

In addition to the standards of the MUTCD described above, the Contracting Agency has scheduled the implementation of crashworthiness requirements for all workzone devices. The National Cooperative Highway Research Project (NCHRP) Report 350 has established requirements for crash testing. Workzone devices are divided into four categories. Each of those categories and the schedule for implementation is described:

Category 1 includes those items that are small and lightweight, channelizing, and delineating devices that have been in common use for many years and are known to be crashworthy by crash testing of similar devices or years of demonstrable safe performance. These include cones, tubular markers, flexible delineator posts, and plastic drums with no attachments. All Category 1 devices used by the project shall meet the requirements of NCHRP 350 as certified by the manufacturer of the device. The Contractor shall obtain the manufacturer's certification documentation for all such devices purchased and shall keep the documentation available for inspection throughout the life of the project.

Category 2 includes devices that are not expected to produce significant vehicular velocity change, but may otherwise be hazardous. Examples of this class are barricades, portable sign supports and signs, intrusion alarms and vertical panels. Any new Category 2 device purchased after October 1, 2000 shall meet the requirements of NCHRP 350. Existing equipment, purchased prior to October 1, 2000, may be used on the project until December 31, 2007. For the purpose of definition, a sign support and sign shall be considered a single unit. A new sign may be purchased for an existing sign support and the entire unit will be defined as "existing equipment." The contract documents will contain provisions that list all Category 2 devices deemed compliant with NCHRP 350 and acceptable for use on the project. The Contractor may select from that list when obtaining new equipment or may submit other products for the Engineer's consideration.

- c. Relocation on the project, provided that, the new locations are in accordance with the contract plans, approved traffic control plan, or the orders of the Engineer; and
 - d. Cleaning up and removing construction signs and traffic control devices on the project that are damaged or destroyed by a third party,
- 3. Operating the vehicle(s) described in Section 1-10.3(2) while transporting the Class B construction signs and other temporary traffic control devices; and
 - 4. Cleaning the Class B construction signs, the other temporary traffic control devices, and the Class A construction signs, when they become illegible because of weather or other conditions and the Engineer orders them to be cleaned.
 - 5. Spotters to warn work crews of impending danger from public traffic, when approved by the Engineer.

The hours eligible for "Traffic Control Labor" will be those hours actually used for the previously described work. Any work described under this section performed by a Traffic Control Supervisor will not be paid as "Traffic Control Labor" but will be covered by the item "Traffic Control Supervisor" per hour.

1-10.3(2) Traffic Control Vehicle

When the bid proposal includes an item "Traffic Control Vehicle," the work required for this item is furnishing a vehicle or vehicles for the Traffic Control Supervisor and for transporting the Class B construction signs and other temporary traffic control devices in the "work area" defined in Section 1-10.5. The eligible work for transporting signs shall be limited to:

- 1. Set up and removal;
- 2. Relocation to and from temporary storage, provided that, the use and location of the temporary storage is approved by the Engineer; and
- 3. Relocation on the project, provided that, the new locations are in accordance with the contract plans, approved traffic control plan, or the orders of the Engineer.

The traffic control vehicle shall be equipped with a roof or post-mount flashing amber light visible for 360 degrees.

1-10.3(3) Construction Signs

All signs required by the approved traffic control plan(s) as well as any other appropriate signs prescribed by the Engineer will be furnished by the Contracting Agency. The Contractor shall provide the posts or supports and erect and maintain the signs in a clean, neat, and presentable condition until the necessity for them has ceased. All nonapplicable signs shall be removed or completely covered with either metal or plywood during periods when they are not needed. When the need for any of these signs has ceased, the Contractor, upon approval of the Engineer, shall take down these signs, posts, or supports. All posts or supports shall be removed from the project and shall remain the property of the Contractor. The Contracting Agency-furnished signs shall be returned to the Engineer in good condition. All such signs lost, stolen, damaged, or destroyed shall be replaced by the Contractor in kind at the Contractor's expense or their value will be deducted from the Contractor's payments.

Construction signs will be divided into two classes. Class A construction signs are those signs that remain in service throughout the construction or during a major phase of the work. They are mounted on posts, existing fixed structures, or substantial supports of a semipermanent nature. Sign and support installation for Class A signs shall be in

1. Initial delivery to the project site (or temporary storage) in good repair and in clean usable condition,
2. Repair or replacement when they are damaged and they are still needed on the project, and
3. Removal from the project site when they are no longer needed on the project.

1-10.3(6) One-Way Piloted Traffic Control Through Construction Zone

The construction sometimes requires that traffic be maintained on a portion of the roadway during the progress of the work using one-way piloted traffic control. If this is the case, the Contractor's operation shall be confined to one-half the roadway, permitting traffic on the other half. If, in the opinion of the Engineer, one-way piloted traffic control is necessary, it shall be provided for in one of the following manners:

Contracting Agency-Furnished One-Way Piloted Traffic Control. The Contracting Agency will furnish, without cost to the Contractor, two flaggers to control traffic at the ends of the pilot car control area and will furnish a pilot car and driver to lead the traffic through the area. All other necessary flaggers within the limits of the pilot car control area shall be furnished by the Contractor as provided in Section 1-10.3(1). If the Contracting Agency is to provide piloted traffic control, the contract provisions will prescribe the extent of the Contracting Agency-Furnished One-Way Piloted Traffic Control.

Contractor-Furnished One-Way Piloted Traffic Control. The Contractor shall furnish the pilot car(s) and driver(s) for the pilot car control area. Any necessary flaggers shall be furnished by the Contractor as provided in Section 1-10.3(1).

When the bid proposal includes an item for "Contractor Piloted Traffic Control," measurement and payment will be as provided in Sections 1-10.4 and 1-10.5.

As conditions permit, the Contractor shall, at the end of each day, leave the work area in such condition that it can be traveled without damage to the work, without danger to traffic, and without one-way piloted traffic control. The Engineer will be the sole judge as to whether or not piloting can be dispensed with after working hours. If piloting is required after working hours due to carelessness or negligence on the part of the Contractor to properly condition the work at the end of the day, such piloting costs shall be borne by the Contractor. If the Contracting Agency is furnishing the piloting, the costs charged to the Contractor will include the pilot car, the pilot car driver, and the two flaggers.

The Contractor shall be responsible for protection of the work and traffic at all times regardless of flagging and pilot car services furnished by the Contracting Agency, and the Contractor shall be liable for damages and injuries suffered by reason of the Contractor's operations or any negligence in connection therewith.

1-10.4 Measurement

Contractor piloted traffic control will be by the hour for any one pilot car control area. Portions of an hour will be rounded up to a whole hour.

Traffic control labor will be by the hour for each hour a person is actually performing the work described in Section 1-10.3(1). Portions of an hour will be rounded up to a whole hour.

“Traffic Control Supervisor,” per hour.

The unit contract price per hour for “Traffic Control Supervisor” shall be full pay for each hour a person performs the duties described in Section 1-10.2(1)B including when performing traffic control labor duties.

“Temporary Traffic Control Devices,” lump sum.

The lump sum contract price shall be full pay for all costs for providing the work described in Section 1-10.3(5). Progress payment for the lump sum item “Temporary Traffic Control Devices” will be made as follows:

- a. When the initial temporary traffic control devices are set up, 50 percent of the amount bid for the item will be paid.
- b. Payment for the remaining 50 percent of the amount bid for the item will be paid on a prorated basis in accordance with the total job progress as determined by progress payments.

“Traffic Control Vehicle,” per day.

The unit contract price per day shall be full pay for all costs involved in furnishing the vehicle or vehicles for the work described in Sections 1-10.3(1)B and 1-10.3(2). The operator(s) of the vehicle(s) will be paid for under the item “Traffic Control Labor” or “Traffic Control Supervisor.”

When the bid proposal does not include an item for any necessary traffic control, all costs for traffic control shall be included, by the Contractor, in the unit contract price for the various other items of work in the bid proposal. The Contractor shall estimate these costs based on the Contractor’s contemplated work procedures.

When traffic control items are included in the bid proposal, payment is limited to the following work areas:

1. The entire construction area under contract and for a distance to include the initial warning signs for the beginning of the project and the end of construction sign. Any warning signs for side roads on the approved traffic control plan are also included. If the project consists of two or more sections, the limits will apply to each section individually.
2. A detour provided in the plans or approved by the Engineer for by-passing all or any portion of the construction, irrespective of whether or not the termini of the detour are within the limits of the contract.
3. The initial point of entry to or crossing of the public road system from Contracting Agency-furnished quarry, pit, borrow, or waste sites, or from Contracting Agency-furnished haul roads serving those sites, when outside the limits in 1 above.

No payment will be made to the Contractor for traffic control items required in connection with the movement of equipment or the hauling of materials outside the limits of 1, 2, and 3 above.

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(all of section 1-2.3)



Washington State Department of Transportation
Construction Office
Transportation Building 47354
Olympia, WA 98504-7354

1-2.3 Construction Traffic Control

1-2.3A Public Convenience and Safety

Under the many special conditions encountered where traffic must be moved through or around construction operations, serious problems of traffic control can occur. Most conditions are temporary and are, therefore, dangerous and difficult to deal with because they are unexpected and not in accordance with the normal pattern of highway traffic. Section 1-07.23(1) of the *Standard Specifications* requires the Contractor to conduct all operations with the least possible obstruction and inconvenience to the public and to provide adequate safeguards, safety devices, protective equipment, and any other needed actions to protect the life, health, safety, and property of the public. The responsibility to comply with these requirements is the Contractor's. It is the Project Engineer's responsibility to ensure that the Contractor complies.

1-2.3B Public Information and Customer Focus

Most drivers still have the expectation of proceeding to their destination with little or no delay even though traffic conditions on many of our highways are deteriorating, primarily due to increased traffic volume. This increased volume may create congestion, delays, accidents and aggressive driving during normal daily operation. Highway construction will usually require a more restricted roadway to accommodate work zones and can further reduce traffic mobility and safety. Even some of our lower volume rural highways can present a challenge due to factors such as drivers not expecting construction work and seasonal/recreational traffic increases. Construction and user delays present significant costs in addition to costs associated with crashes and worker safety. These delays and costs can be minimized by implementing a traffic control strategy based on traffic conditions and construction requirements, and which includes public information and customer focus considerations.

Our goal on every highway construction project should be to provide the best overall balance of work zone safety and traffic mobility while constructing quality highway projects. Much of our effort is directed at engineering responses to safety and mobility issues and is generally included in the contract requirements. Recent customer-focused highway construction studies have shown that accurate and timely project information is a valuable element in an overall traffic control strategy. Advance planning and coordination between the project engineer and contractor is necessary to ensure that there is an opportunity to provide public information for all phases of the project that impact traffic. Proper use of public information and customer-focused techniques will provide safety and mobility benefits that would not otherwise be gained, as listed below:

- Alert drivers to potential delays by advance notice through project signing and the news media that would allow drivers to take alternate routes, adjust scheduled trips and have better awareness of traffic impacts and how to avoid them.
- Provide benefits to the Contractor from reduced traffic volume and better driver awareness through fewer crashes, less material delivery delay, better worker safety, fewer complaints and overall public acceptance of the project.
- Achieve better driver acceptance, reduced aggressive driving and improved work zone credibility by minimizing delays and providing accurate and timely information.
- Consider innovative construction techniques and shorter term intense work stages with more severe traffic restrictions, such as weekend closures, if possible.
- Closely monitor traffic conditions when traffic is restricted to determine the need for any traffic control or work hour adjustments that would improve traffic flow. Specified working hours and the accompanying traffic restrictions are critical elements of the project traffic control strategy and should not be adjusted without proper traffic analysis.
- Maintain ongoing communication during the life of the project with local law enforcement, emergency services, local agencies, transit groups, affected local businesses, etc.
- Continue use of innovative devices such as portable, changeable message signs, project information signs with information phone number and highway advisory radio systems.

The Regional Construction Manager, Traffic Engineer, and Public Information Officer should be involved in the project traffic control strategy and may be able to offer assistance.

1-2.3C Work Zone Traffic Control

1-2.3C(1) General

The primary function of work zone traffic control is to move vehicles and pedestrians safely through or around work zones while protecting on-site workers and accommodating the Contractor's construction operations.

The "General" requirements for traffic control (Section 1-10.1 of the *Standard Specifications*) address the responsibility to provide adequate traffic control measures at work zones as follows:

- Regardless of any flagging or piloting services furnished by WSDOT, responsibility for protection of the work and traffic remains with the Contractor.
- A careful appraisal of the pilot car operation may indicate the need for adjustments in work zone length or other features that may be contributing to congestion. The Contractor's work operation should generally be restricted to one side of the roadway and not interrupt the alternating traffic movement.

1-2.3C(4) Construction and Maintenance of Detours

Construction zone detours will normally be detailed in the plans. When detours not shown in the plans are required, the design will likely be done by the construction office under the direction of the Project Engineer and requirements of the MUTCD. If the detour is a full-fledged roadway, design and traffic reviewers should check the design. Short-term minor detours may be installed and operated without formal review, but the Project Engineer must be satisfied that the facility is suitable and safe for traffic use.

Existing pavement markings on asphalt pavement should never be merely blacked out with oil or paint. Rather, the striped and adjacent areas should be sandblasted or ground in a pattern different from the original marking until the marking is no longer visible. This change in pattern minimizes the possibility that the original marking will still be visible to drivers, especially at night or in rainy weather when covered-over stripes have a tendency to shine in contrast to the pavement. Temporary pavement marking tape, either for temporary lane marking or masking of existing markings may offer another option.

Barricades and barriers are inherently fixed object hazards. Therefore, they should not be used unless the combined hazard for the motorist and the workers of operating without barriers is greater than the hazard of striking the barriers themselves. They should not be used as primary delineation to guide traffic. Delineation devices must be maintained, and kept clean. When delineators become covered with grime or are damaged, they become ineffective. The condition and positioning of these devices should be checked daily.

1-2.3C(5) Road/Ramp Closures

When it is necessary to close a road, street, or ramp, the Project Engineer shall submit a request that includes the appropriate closure/detour plan to the Region Traffic Engineer in advance of the need. Per RCW 47.48.010, the Regional Administrator may close a road, street, or ramp.

With proper planning and implementation, road/ramp closures can be an effective and safe method of traffic control. As required by RCW, notice of the closure shall be published in one issue of a newspaper in the area in which the closure is to take place. Signs indicating dates and times of the closure shall be placed at each end of the section to be closed on or before publishing the notice in the newspaper. Publishing the notice and placing of the signs shall be a minimum of three days in advance of the closure. Advance notice using local radio, portable changeable message signs or HAR may be effective in diverting traffic from the closed or impacted locations. Coordinate with the Region Public Information Officer for assistance with public notification.

In cases of emergency, or closures of 12 hours or less, the road, street, or ramp may be closed without prior notice to the public. If possible, a notice should be posted one working day in advance of the closure.

1-2.3C(6) Traffic Control Plans

"Traffic Control Plans" (Section 1-10.2(2) of the *Standard Specifications*) addresses the requirements of Traffic Control Plans (TCP). The Contractor, working in coordination with the TCM, must adopt the TCPs appearing in the contract or propose modified TCPs to be used for the project. The Contractor must submit proposed modifications to TCP's at least ten calendar days in advance of the time the signs and other traffic control devices will be required. Approval of these plans must be obtained before the work can begin.

Minor modifications to the TCP may be made by the Traffic Control Supervisor to accommodate site conditions. Modifications or adjustments to the plan must maintain the original intent of the plan. When there is a change in the intent and/or substantial revisions are needed, a revised TCP shall be submitted for approval through the TCM to the Project Engineer. The Regional Traffic Office should be consulted when this situation occurs.

Traffic Plans should not only address all work zones and standard devices and signs but should also address issues such as:

- conflicting or temporary pavement markings
- maintaining existing operational signs and covering conflicting signs
- staging requirements
- temporary vertical or lateral clearance restrictions
- temporary work zone illumination
- consistency with any work hour restrictions

far in advance of the work area has little value. It is also necessary to inform the motorists when they have left the restriction area. If the end of this restriction area is the end of the project, the Class "A" "END ROAD WORK" sign should be sufficient. If the restriction ends within the project limit, a reverse taper of traffic cones ending the lane or shoulder closure or a portable "END ROAD WORK" sign is adequate. If traffic congestion extends past the first advance warning sign, the sign should be moved back or another sign installed to provide adequate warning. Turning signs away from oncoming traffic is not adequate since traffic approaching from other directions may be exposed to the sign.

Signing for nighttime traffic is more difficult than that required for daylight hours. All signs used during the hours of darkness shall be reflectorized. A review of the project signing should be made and recorded during the hours of darkness.

Signs and other traffic control devices should be shown on the contract TCP's and should be installed with adjustments for work zone and traffic conditions. If typical TCPs are used rather than site-specific TCPs, additional signs or devices may be needed to address the actual work zone conditions. The Contractor (TCM and TCS) and WSDOT (TCS) should ensure proper use and placement of signs and devices. For situations not addressed by the TCPs, the Project Engineer will determine who is responsible for preparing a revised TCP. Refer to the Work Zone Traffic Control Guidelines Book, MUTCD, or seek assistance from the Region Traffic Engineer for appropriate TCP revisions. A modified or new TCP may be needed if adjustments to signs and devices do not adequately address existing hazards or resolve observed traffic problems or accidents.

1-2.3C(9) Flaggers, Spotters and Traffic Control Labor

- **FLAGGERS**

Typically, flaggers have the highest exposure to traffic hazards and are more frequently injured or killed than other workers. Flaggers should only be used when all other forms of traffic control are inadequate to control traffic. When flaggers are used, flagging stations must be shown on the TCP along with the required warning signs and devices. Flagger stations should be protected with a positive barrier, if possible. The flagger should also have in mind an "escape plan" to avoid errant vehicles. It is not recommended to use flaggers at locations, such as freeways, where their primary function of warning or directing traffic is ineffective or not intended. Use of flaggers to exclusively display the "SLOW" message is also not recommended.

Additional guidance on the use of flaggers is located in the *"Traffic Manual"*, *"Standard Specifications"* and the *"Work Zone Traffic Control Guidelines Book."*

All flaggers working on WSDOT construction projects must have a valid State of Washington flagging card or a flagging card issued by the states of Oregon or Idaho.

- **SPOTTERS**

Flaggers used as spotters to protect an exposed work crew may be considered appropriate if other worker safety measures are not feasible. Before the Project Engineer approves the use of a spotter, careful evaluation of the hazards involved should indicate that the spotter can actually provide a safety benefit to the work crew without undue risk to the spotter.

- **TRAFFIC CONTROL LABOR**

Workers involved in traffic control labor are required to wear high visibility clothing as specified in Section 1-07.8 of the *Standard Specifications*. For some projects, labor in addition to the assigned Flaggers is needed to install and remove traffic control in an efficient manner. The item, "Traffic Control Labor" will be measured and paid by the hour for the actual number hours performing work as described in Section 1-10.3(1) of the *Standard Specifications*. No additional hours will be allowed for relief flaggers when the regular flagger is on break except that when a TCS acts as a relief flagger for approximately 15 minutes or less, both shall be paid their respective rate through the break period. No adjustment in the hourly bid amount will be paid for overtime work.

Portions of an hour will be rounded up to a whole hour.

1-2.3C(10) WSP Traffic Control Assistance

WSDOT has an agreement, GC9131, with the Washington State Patrol (WSP) for that agency to provide troopers and vehicles to help with traffic control on construction projects. WSP traffic control assistance is considered an enhancement to the required work zone traffic control and should be reserved for those work zones that have unusual hazards or a high degree of worker exposure to traffic which cannot be addressed by traditional traffic control means. In areas where GC9131 is not used, the WSP are usually helpful during their normal course of business.

The Project Engineer should ensure that good communication is maintained with WSP troopers assigned to the project and that the appropriate traffic control strategy is applied. On each shift of WSP traffic control assistance, Form 421-045, WSP Field Check List, shall be filled out. WSDOT will fill out the top portion of the form and give it to the WSP trooper on the project to complete. At the end of the officer's shift, the completed form shall be returned to WSDOT.

Administration

- Regions will take the lead in scheduling statewide annual traffic control reviews.
- State Traffic Office will prepare an annual summary of the statewide traffic control reviews.

1-2.3F Resources for Traffic Control and Work Zone Safety

The following information may provide additional guidance and more specific detail. Also, this list includes the staff, reference documents and manuals mentioned throughout Section 1-2.3 of this manual.

- *Work Zone Traffic Control Guidelines*, M 54-44
- *Traffic Manual*, Chapter 5, M 51-02
- MUTCD Part VI
- Work Zone Safety Task Force Recommendations
- Quality Standards for Work Zone Traffic Control Devices (ATSSA)
- Work Zone Traffic Control Supervisor's Notebook
- Highway Work Zone Reviews, 1997 (Work Zone Safety Task Force)
- Planning and Scheduling Work Zone Traffic Control (FHWA-IP-81-6)
- Directive D 55-20, Reduced Speed in Maintenance and Construction Zones
- Instructional Letter IL 4008.00, "WSP Traffic Control Assistance in Work Zones"
- Traffic Control Supervisor Evaluation - Final Report
- Region Construction or Traffic Office and Public Information Officer
(Traffic Engineer or Work Zone Traffic Control Specialist)
- State Traffic Office
(Traffic Specialist or Traffic Control Engineer)

Work Zone Traffic Control Guidelines

May 2000
M54-44



Washington State Department of Transportation
Field Operations Service Support Center

Forward

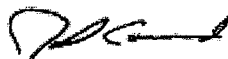
While this booklet provides interpretive guidance, it does not change the intent of Part VI of the Manual on Uniform Traffic Control Devices (MUTCD). The traffic control devices and distances shown in this booklet reflect desired minimums for WSDOT use.

Good traffic control is essential, not only for the safety of the traveling public, but also for WSDOT employees and those construction workers whose jobs often require them to be in close proximity to high speed traffic. The traffic control guidelines in this booklet are intended to reduce field personnel's exposure to the hazards of traffic and offer the driving public consistent and positive guidance through work zone areas. Safety of crews and the driving public must be an integral part of WSDOT field operations.

We emphasize that these are guidelines and not absolute standards. The traffic control plans in this booklet are to be used along with sound judgment. Proper planning, a good safety conscious attitude and full participation from the persons involved in the work zone are all prerequisites to good traffic control. Aspects of the roadway environment such as weather, time of day, traffic volumes, traffic speed, roadway geometry, roadside conditions, and your inventory of traffic control devices should all be considered when implementing the guidelines of this booklet. If you have any questions or needs not addressed here, please consult your Regional Traffic Office staff.

Be assured that the Work Zone Safety Task Force and I are committed to securing increased funding for better and safer work zones through the legislative process to meet your workforce and equipment needs.

John Conrad



Assistant Secretary
for Field Operations

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Introduction

The primary function of work zone traffic control is to allow vehicles and pedestrians to move safely and easily through or around work areas. Effective temporary traffic control enhances traffic safety and efficiency. Drivers and pedestrians need to be guided in a clear and positive manner while approaching and traversing temporary traffic control zones.

The traffic control plans contained in this booklet are furnished as a guide to be used along with good judgment. Minor modifications may be made, as necessary, to accommodate site conditions; however, a plan's original intent must be maintained. An alternate plan should be considered if substantial revisions are needed. Consult the Region Traffic Office Staff for additional guidance.

No single set of traffic control plans can satisfy all conditions for all work zones. The Manual on Uniform Traffic Control Devices (MUTCD) was adopted by WSDOT as the legal standard. Principles set forth in Part VI of the MUTCD titled "Standards and Guides for Traffic Controls for Street and Highway Construction, Maintenance, Utility and Incident Management Operations" are represented in this booklet to provide traffic control guidance for common work operations.

Instructions

Procedures

1. Provide substantial protection and minimize worker exposure to traffic by applying barriers and devices in practical ways. Long term projects may warrant the use of concrete barrier while short term projects can be better served by a truck mounted attenuator (TMA). Always consider the use of a protective barrier.
2. Prior to the beginning of work operations, evaluate all aspects of the work area, including sight distance, traffic speed, volume, road approaches and the type of work activity, before deciding on a traffic control plan.
3. After the traffic control plan is implemented, the supervisor (i.e. the person(s) supervising the actual work task(s) for which the TCP was implemented – e.g. Maintenance Lead Tech, Construction Project TCS(s) – both WSDOT and contractor, survey party chief) should drive through the work area, at the anticipated speed of the motorists, to determine the effectiveness of the plan. Additional reviews throughout the day are recommended to insure that traffic control devices remain in place.
4. Traffic control devices must be moved ahead whenever work advances to more than 2 miles from the advance warning signs. **In a mobile flagging operation the "flagger ahead (symbol or text message)" sign is recommended to be within 1,000 feet of the flagger, any time a flagger is deployed.**

Equipment

1. Personal Protective Wear:

The wearing of soft caps is permitted, except when required by state safety regulations WAC 296-155-205, WAC 296-155-305 and WAC 296-24-084 and when working on or around the following:

- Asphalt Plant, Crushers, Blasting Area, Asphalt grinding operations.
- Construction of bridges, structures, retaining walls, etc.
- Overhead work such as working in a trench, rock-fall areas, sign installation, installing poles, work under bridges, electrical conductors, etc.
- Working near operating equipment with arms, booms, buckets, etc.
- Work around cranes, pile driving, drilling.
- During work as a flagger.
- Brush cutter work, danger tree work, other logging operations.
- Any designated hard hat area.

Supervisors have the authority to require employees to wear hard hats for other activities where there is a danger from impact and/or penetration of falling and flying objects. Employees must have a hard hat on site and readily available for use when work conditions require their use.

Traffic Vest, Coveralls, Rain Gear and T-Shirts

While working on foot in a highway right of way (fence line to fence line) all WSDOT workers must:

- Wear reflective vests, except that during daylight hours, clothing of orange, yellow, strong yellow green or fluorescent versions of these colors may be worn in lieu of reflective vests. Flaggers must wear reflective vests and hard hats at all times.
- During hours of darkness, wear vests, white coveralls or either high visibility reflective strong yellow green pants with red-orange strip or red-orange pants with lime yellow strip.
- When rain gear is worn during the hours of darkness, it shall be white or yellow.
- The reflective vests shall always be the outermost garment.

page 6). Allow for roll ahead distance resulting from an impact. Refer to the data block on the TCPs for specific information. The Protective vehicle can be a work vehicle if no other vehicles are available.

- **Shadow Vehicle** - Very similar to the protective vehicle but usually a moving vehicle (mobile work zones). All of the above guidelines for the protective vehicle apply to the shadow vehicle. A sequential arrow panel or truck mounted Portable Changeable Message Sign(PCMS) may also be used on the shadow vehicle.

6. **Truck Mounted Attenuators (TMA):**

Recommended for high speed work zone protection. If a TMA is not available, the use of a protective or shadow vehicle is still highly recommended.

Consider the following for determining TMA use:

- **Speed of Traffic** - Higher operating speeds leave less response time and impacts generally result in more severe injuries and damage. Therefore, the higher the operating speed the more probability that a TMA is necessary.
- **Type of activity** - Mobile, intermittent or stationary.
- **Duration of project.**
- **Roadway environment** - Access controlled vs. non-access controlled, urban vs. rural, and roadway geometrics. Access controlled facilities frequently give drivers a false sense of security since interruptions are not expected. Therefore, activities on freeways may be more susceptible to incidents than are activities on non-access controlled facilities, where drivers are generally more alert.
- **Traffic volumes** - More traffic means more worker exposure.
- **Exposure to special hazards** - Operations involving personnel on foot or located in exposed positions (for example, on the platform of a pickup truck placing cones or in a lift-bucket performing overhead operations) are particularly susceptible to high severity incidents.
- **Location of work area** - Locations of primary concern are those within the traveled lanes or within frequently used, all-weather, shoulders. Activities taking place within the traveled lanes are more likely to become involved in an incident than are shoulder activities.
- **Roll Ahead Distance** - The roll ahead distances shown in the BUFFER DATA blocks on the TCPs are conservative values, based upon a 24,000 lb. vehicle impacting the TMA. These distances may be reduced, after consideration of all the above factors, including the mix of vehicle type traveling past the work site. The Region Traffic Office should be contacted for concurrence with reductions in the R distances.

7. **Portable Changeable Message Signs (PCMS):**

- Recommended for high speed, high volume roadways, or work operations that require a highly visible message.
- Shall **not** be used to replace required signs
- Place in advance of other temporary traffic control zone signing.
- Should be visible for ½ mile minimum (both day and night).
- Should be legible for at least 650 ft. (all lanes).
- Should be able to be read twice at the posted speed.
- Each individual display should convey a single thought.
- A complete message cycle should consist of **no more than two** displays in sequence.
- Bottom of sign panel shall be a minimum of 7' above roadway.
- PCMS shall automatically adjust its light source relative to surrounding conditions.
- Messages shall not scroll horizontally or vertically across the sign face.
- Consider truck mounted PCMS for shadow vehicles.

8. **Sequential Arrow Panel (Flashing Arrow Board):**

- Required for all lane closures on multi-lane roads, except during emergencies.
- An arrow shall not be used on a multi-lane roadway to laterally shift traffic.
- An arrow display shall not be used on a two lane, two way roadway.
- Do not use arrow display for shoulder closures.
- Use caution mode for shoulder closures.
- Only the four corner flash shall be used to indicate caution.
- Use **only one** arrow display per lane being closed (unless used in mobile operations).
- Arrow should be used in combination with other appropriate traffic control devices.

11. Concrete Barrier:

A semi-rigid barrier designed to prevent intrusion of errant vehicles into work areas. Recommended for long term stationary work areas with high exposure to traffic. Contact the Region Traffic Office Staff for site specific placement information.

Consider the following for use of concrete barriers:

- Areas where there is a high potential for injury to workers or "no escape" areas such as internal lane work, work zones in tunnels, bridges, lane expansion work, etc.
- Long term, stationary jobs
- Areas of high exposure to workers and motorists such as high speed and high volume of traffic.

Consider the following for use of movable barrier such as Transfer/Transport Vehicle (TM) (barrier and special vehicle):

- High volume traffic conditions with very short-term lane closures.
- Continuous operation over an extended period of time, where there is a need to get the lane back in operation at some point in the day. (Could be used in lieu of reduced lane widths or lane reduction, i.e. HOV lane additions; wall next to roadway.)

12. Barricades:

Generally used to protect spot hazards but can also be used to close roadways and sidewalks with appropriate signing. Barricades can also be used to provide additional protection to work areas. *Lights used to channelize traffic must be steady burning (Type C).*

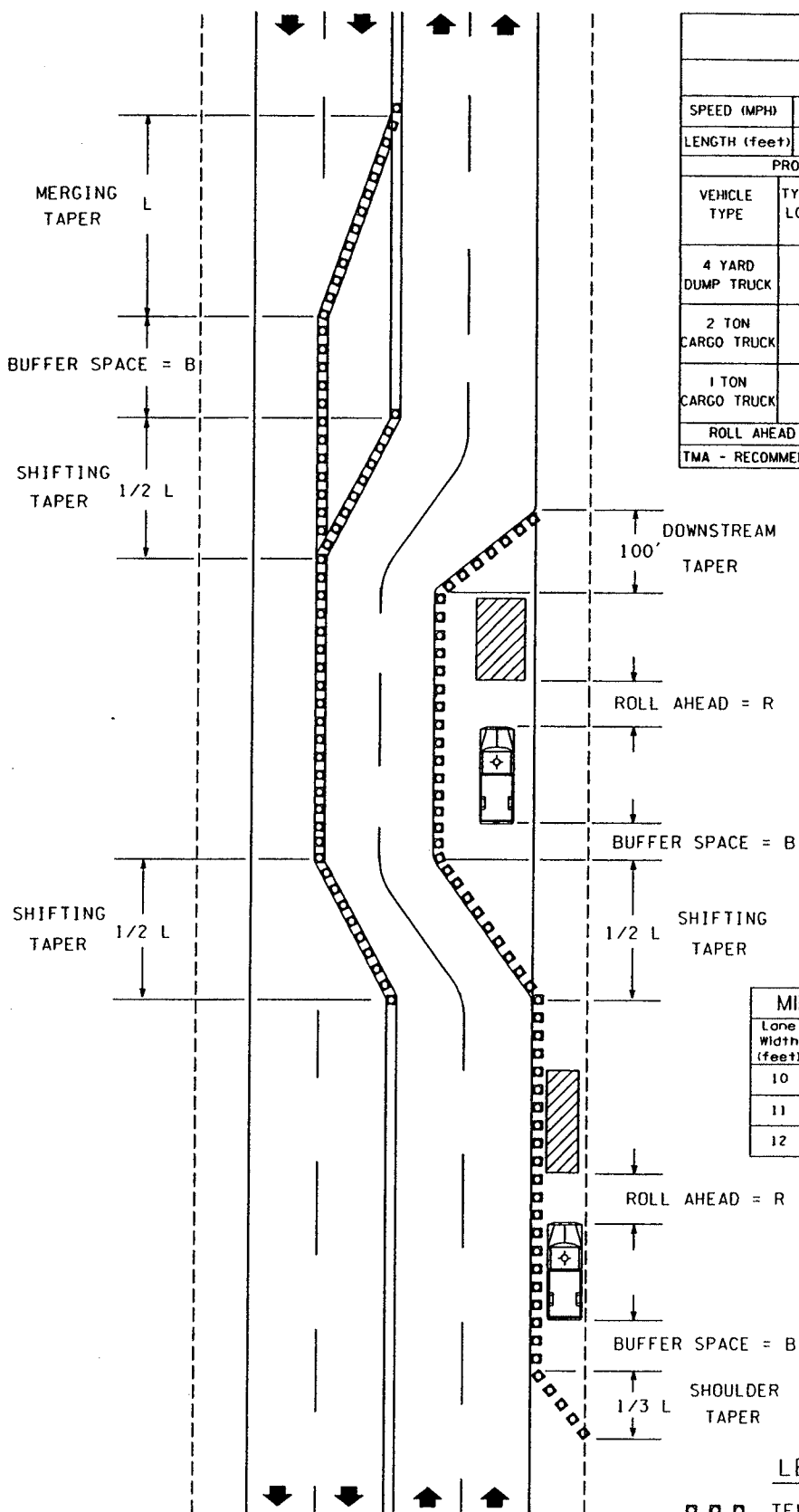
13. Flares:

All work vehicles should carry a supply of flares. Use flares only to alert drivers to emergencies and not as routine traffic control device. Emergencies are defined as unexpected events where life threatening conditions, injuries or property damage may occur unless immediate action is taken. Use caution at accident sites where flammable materials, such as fuel spills, are suspected.

Consider the following for use of flares:

- Primarily used in high hazard conditions only (i.e. accidents, spills, equipment breakdowns, dangerous snow and ice conditions, etc.)
- Use electronic flares or orange/red-glow sticks instead of burning flares where flammable materials are suspected.

7. If at all possible, do not stand in the shade.
8. Never flag from inside a vehicle.
9. Do not lean, sit or lie on a vehicle.
10. Stand alone. Do not permit a group of workers to congregate around you.
11. Familiarize yourself with the nature of the work being performed. Be able to answer motorists' questions.
12. Establish a warning signal with the work crew in case of an emergency.
13. Plan an escape route in case of an emergency.
14. Stay alert! Be ready to respond to an emergency.
15. Record the license number and description of any vehicle whose driver disobeys your instructions and threatens the safety of the work area. Report information to authorities.
16. Be courteous and professional.
17. Keep your mind on your job. Be aware of the work in progress.
18. Do not do any other work when flagging.
19. Do not involve yourself in unnecessary conversation with workers, pedestrians, or motorists.
20. Do not leave your position until you are appropriately relieved.
21. Cover, turn or remove the "FLAGGER AHEAD" sign when a flagger is no longer on duty.
22. Always carry your flagger certification card while on the job.



BUFFER DATA										
BUFFER SPACE = B										
SPEED (MPH)	25	30	35	40	45	50	55	60	65	70
LENGTH (feet)	55	85	120	170	220	280	335	415	485	585
PROTECTIVE VEHICLE ROLL AHEAD DISTANCE = R*										
VEHICLE TYPE	TYPICAL VEHICLE LOADED WEIGHT (LBS)	POSTED SPEED (mph)		STATIONARY OPERATION (feet)		• VALUES MAY BE REDUCED IN ACCORDANCE WITH TMA USE, SEE PAGE 5.				
4 YARD DUMP TRUCK	24,000	60-70		100						
		50-55		75						
		45		50						
2 TON CARGO TRUCK	15,000	60-70		150						
		50-55		100						
		45		75						
1 TON CARGO TRUCK	10,000	60-70		200						
		50-55		150						
		45		100						
ROLL AHEAD STOPPING DISTANCE ASSUMES DRY PAVEMENT										
TMA - RECOMMENDED, SEE TABLE FOR APPLICATION PRIORITIES, PAGE 6.										

CHANNELIZING DEVICE SPACING (FEET)		
MPH	TAPER	TANGENT
50/70	40	80
35/45	30	60
25/30	20	40

MINIMUM TAPER LENGTH (L) IN FEET										
Lane Width (feet)	Posted Speed (mph)									
	25	30	35	40	45	50	55	60	65	70
10	105	150	205	265	450	500	550	-	-	-
11	115	165	225	295	495	550	605	660	-	-
12	125	180	245	320	540	600	660	720	780	840

- LEGEND**
- □ □ TEMPORARY TRAFFIC CONTROL DEVICES
 - 🚗 PROTECTIVE VEHICLE - RECOMMENDED

STATIONARY OR SHORT DURATION WORK ZONES

Traffic Control Plans (TCP's) 1 to 11

Stationary work zones are used for work activities that exceed one hour but could last for several days. Signs and channelizing devices are required for stationary work zones. Devices, such as sequential arrow panels, barricades and protective vehicles, may also be used depending on the situation. For longer term projects, temporary concrete barriers or water filled barriers, temporary pavement markings and post mounted signs might be typical devices. Examples of stationary work zone operations include: light standard repair, paving, sign installation and bridge repair. Stationary work zone traffic control is usually associated with a substantial work operation that may have many workers, equipment, truck hauling and flagging. Traffic operation, all work activities, workers and flaggers must be incorporated into the work zone and provided for during planning and selecting the Traffic Control Plans (TCP's).

Short duration work zones are used for work activities less than 60 minutes. Due to the short work time simplified traffic control set-ups are allowed to reduce the hazards of traffic exposure to workers. The time it may take to set up a full complement of signs and devices could approach the amount of time it requires to perform the work. Careful consideration of traffic and roadway conditions must be given to each work zone prior to selecting the most appropriate traffic control set-up. Shoulder work and low speed, low volume lane work may only require the use of the work vehicle hazard beacon, a flagger and a warning sign. High speed, high volume lane work requires a full lane closure set-up, even though work duration may be 60 minutes or less. Remember, short duration work is not a "short cut", it's a traffic control method that reduces worker exposure to traffic hazards by using larger, more mobile equipment instead of many smaller devices (cones are recommended in most cases since they are quick to set up for small work zones). Examples of short duration work zone operations include, re-lamping, pot hole repair, Vactor work, etc..

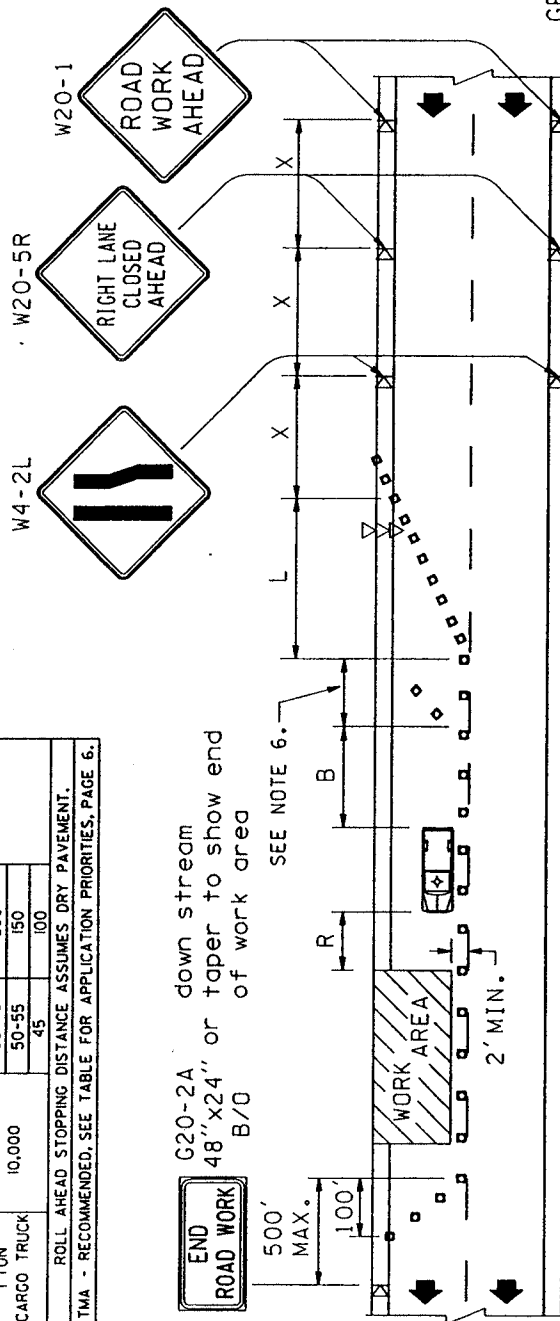
The following TCP's show typical stationary and short duration work zones.

BUFFER DATA												
BUFFER SPACE = B												
SPEED (MPH)	25	30	35	40	45	50	55	60	65	70		
LENGTH (feet)	55	85	120	170	220	280	335	415	485	585		
PROTECTIVE VEHICLE ROLL AHEAD DISTANCE = R *												
VEHICLE TYPE	TYPICAL VEHICLE LOADED WEIGHT (LBS)		POSTED SPEED (mph)		STATIONARY OPERATION (feet)		* VALUES MAY BE REDUCED IN ACCORDANCE WITH TMA USE, SEE PAGE 5.					
4 YARD DUMP TRUCK	24,000		60-70		100							
			50-55		75							
2 TON CARGO TRUCK	15,000		45		50							
			60-70		150							
			50-55		100							
1 TON CARGO TRUCK	10,000		45		75							
			60-70		200							
			50-55		150							
			45		100							
ROLL AHEAD STOPPING DISTANCE ASSUMES DRY PAVEMENT.												
TMA - RECOMMENDED, SEE TABLE FOR APPLICATION PRIORITIES, PAGE 6.												

MINIMUM TAPER LENGTH (L) IN FEET												
Posted Speed (mph)												
Lane Width (feet)	25	30	35	40	45	50	55	60	65	70		
10	105	150	205	265	450	500	550	-	-	-		
11	115	165	225	295	495	550	605	660	-	-		
12	125	180	245	320	540	600	660	720	780	840		

SIGN SPACING = X (FEET)			
Freeways & Expressways	55/70 MPH	1500'++ (OR AS PER MUTCD)	
Rural Roads	45/55 MPH	500'++	
Urban Arterials & Rural Roads	35/40 MPH	350'++	
Rural Roads	25/30 MPH	200'++	
Urban Streets & Residential Districts			
All signs are 48"x48" black on orange unless otherwise designated.			

CHANNELIZING DEVICE SPACING (FEET)			
MPH	TAPER	TANGENT	
50/70	40	80	
35/45	30	60	
25/30	20	40	



(SAMPLE MESSAGE)		
PCMS		
1	2	
RIGHT LANE CLOSED	1 MILE AHEAD	
1.5 SEC	1.5 SEC	

Field locate 1 mile +-
In advance of lane closure.

GENERAL NOTES

1. PROTECTIVE VEHICLE RECOMMENDED - MAY BE A WORK VEHICLE.
2. CONTACT REGION TRAFFIC OFFICE STAFF FOR WORK HOURS.
3. EXTEND DEVICE TAPER ACROSS SHOULDER.
4. DEVICES SHOULD NOT ENCRoACH INTO ADJACENT LANES.
5. PCMS RECOMMENDED.
6. USE TRANSVERSE DEVICES IN CLOSED LANE EVERY 1000' +-.
7. TRAFFIC SAFETY DRUMS, RECOMMENDED FOR FREEWAY USE (IN LIEU OF CONES).

LEGEND

- ▣ SIGN LOCATION
- ▢ SEQUENTIAL ARROW SIGN
- ▣ TEMPORARY TRAFFIC CONTROL DEVICES
- ▣ PROTECTIVE VEHICLE - RECOMMENDED

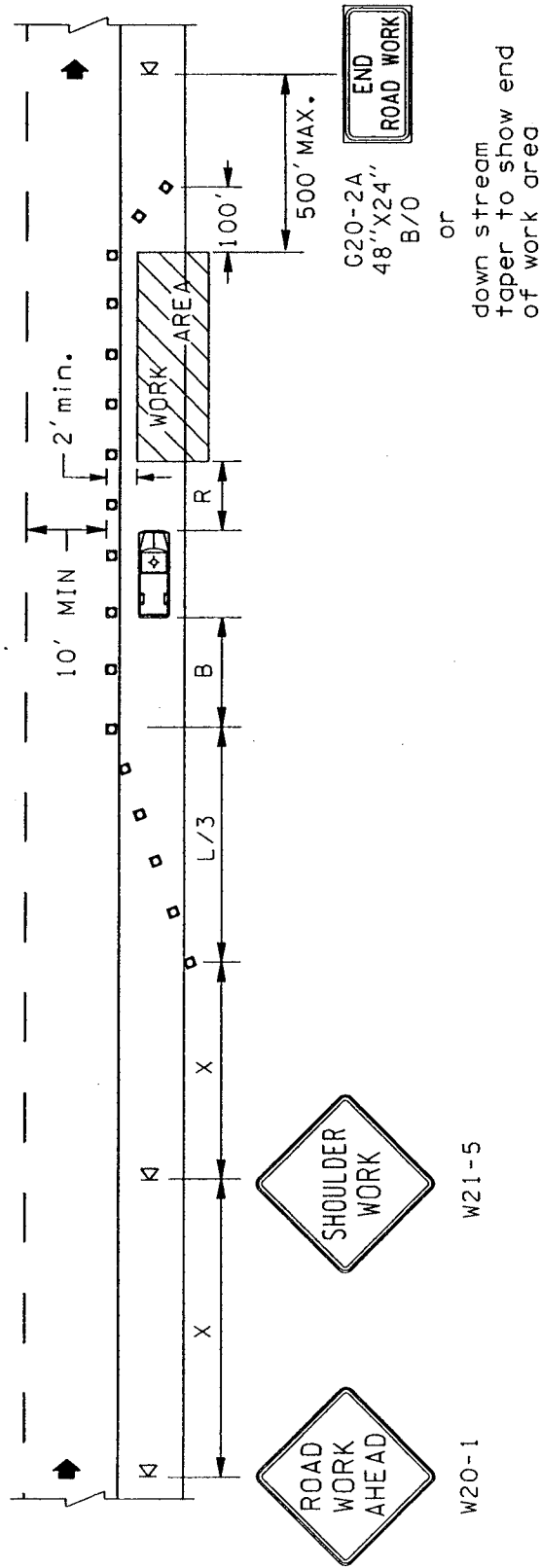
SINGLE-LANE CLOSURE FOR MULTI-LANE ROADWAYS TCP 2

BUFFER DATA											
BUFFER SPACE = B											
SPEED (MPH)	25	30	35	40	45	50	55	60	65	70	
LENGTH (feet)	55	85	120	—	—	—	—	—	—	—	
PROTECTIVE VEHICLE ROLL AHEAD DISTANCE = R*											
VEHICLE TYPE	TYPICAL VEHICLE LOADED WEIGHT (LBS)	POSTED SPEED (mph)	STATIONARY OPERATION (feet)	* VALUES MAY BE REDUCED IN ACCORDANCE WITH TMA USE, SEE PAGE 5.							
4 YARD DUMP TRUCK	24,000	60-70	50-55	45	50	55	60	65	70		
2 TON CARGO TRUCK	15,000	60-70	50-55	45	50	55	60	65	70		
1 TON CARGO TRUCK	10,000	60-70	50-55	45	50	55	60	65	70		
ROLL AHEAD STOPPING DISTANCE ASSUMES DRY PAVEMENT											
TMA - RECOMMENDED, SEE TABLE FOR APPLICATION PRIORITIES, PAGE 6.											

SIGN SPACING = X (FEET)			
Urban Arterials	35	MPH	350+/-
Urban Streets	25/30	MPH	200+/-
Residential & Business Districts	25/30	MPH	200+/-
All signs are 48"x48" block on orange unless otherwise designated.			

CHANNELIZING DEVICE SPACING (FEET)		
MPH	TAPER	TANGENT
35	30	60
25/30	20	40

MINIMUM TAPER LENGTH (L) IN FEET											
Lane Width (feet)	Posted Speed (mph)										
	25	30	35	40	45	50	55	60	65	70	
10	105	150	205	—	—	—	—	—	—	—	
11	115	165	225	—	—	—	—	—	—	—	
12	125	180	245	—	—	—	—	—	—	—	



LEGEND

Δ SIGN LOCATION

□ □ □ TEMPORARY TRAFFIC CONTROL DEVICES

□ □ □ PROTECTIVE VEHICLE - RECOMMENDED

SHOULDER CLOSURE - LOW SPEED
(35 MPH OR LESS)
TCP 4

GENERAL NOTES

1. PROTECTIVE VEHICLE RECOMMENDED - MAY BE A WORK VEHICLE.

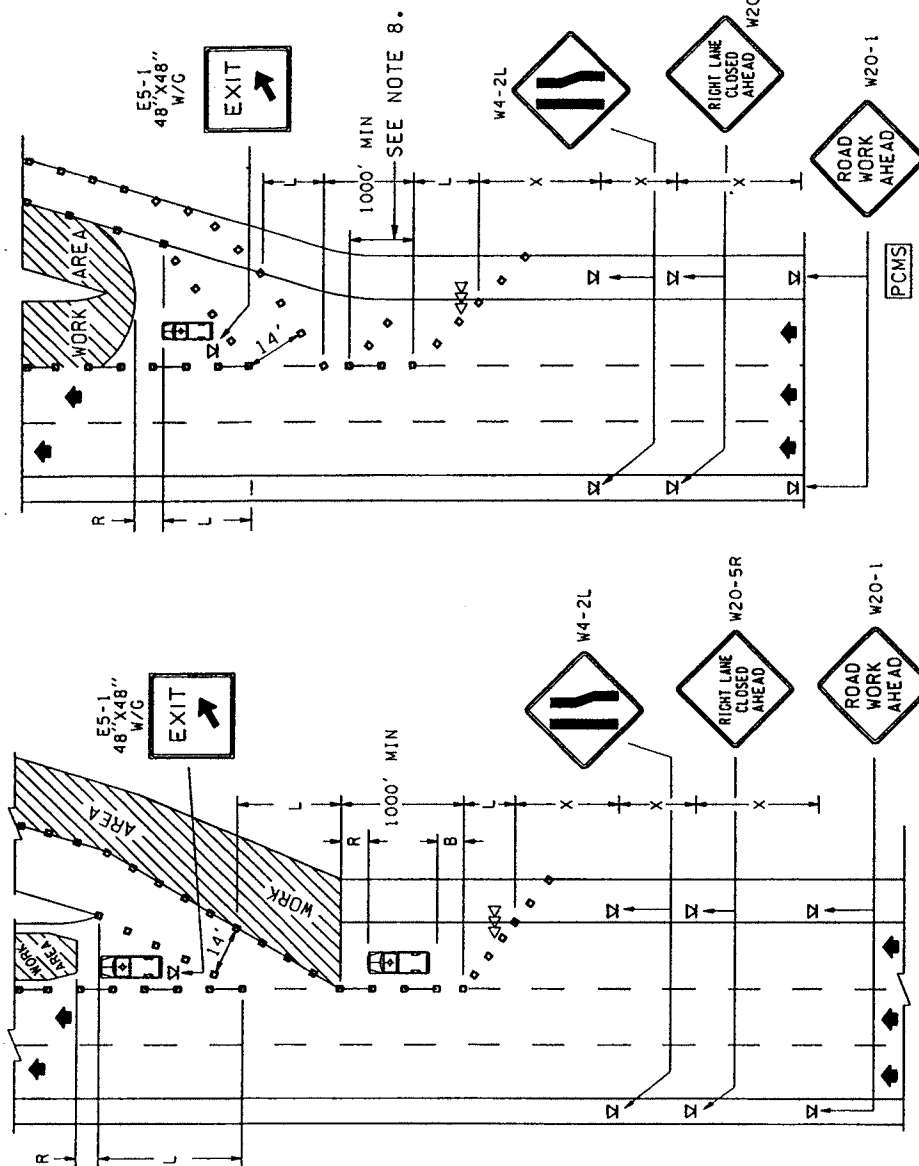
BUFFER DATA												
BUFFER SPACE = B												
SPEED (MPH)	25	30	35	40	45	50	55	60	65	70		
LENGTH (feet)	—	—	—	—	170	220	280	335	415	485	585	
PROTECTIVE VEHICLE ROLL AHEAD DISTANCE = R*												
VEHICLE TYPE	TYPICAL VEHICLE LOADED WEIGHT (LBS)			POSTED SPEED (mph)			STATIONARY OPERATION (feet)			* VALUES MAY BE REDUCED IN ACCORDANCE WITH TMA USE. SEE PAGE 5.		
4 YARD DUMP TRUCK	24,000			60-70			100					
				50-55			75					
				45			50					
2 TON CARGO TRUCK	15,000			60-70			150					
				50-55			100					
				45			75					
1 TON CARGO TRUCK	10,000			60-70			200					
				50-55			150					
				45			100					
ROLL AHEAD STOPPING DISTANCE ASSUMES DRY PAVEMENT												
TMA - RECOMMENDED, SEE TABLE FOR APPLICATION PRIORITIES, PAGE 6.												

MINIMUM TAPER LENGTH (L) IN FEET												
Lane Width (feet)	25	30	35	40	45	50	55	60	65	70		
10	—	—	—	265	450	500	550	—	—	—		
11	—	—	—	295	495	550	605	660	—	—		
12	—	—	—	320	540	600	660	720	780	840		

SIGN SPACING = X (FEET)		
Freeways & Expressways	55/70 MPH (OR AS PER MUTCD)	1500**
Rural Roads	45/65 MPH	500**
Urban Arterials	40 MPH	350**
All signs are 48"x48" black on orange unless otherwise designated.		

GENERAL NOTES

1. THE DESIRABLE RAMP OPENING WIDTH IS 14'.
2. A G20-2A END ROAD WORK SIGN SHOULD BE INSTALLED ABOUT 500 FEET BEYOND THE WORK AREA OR USE A DOWN STREAM TAPER.
3. CONTACT REGION TRAFFIC OFFICE STAFF FOR WORK HOURS.
4. PROTECTIVE VEHICLE RECOMMENDED - MAY BE A WORK VEHICLE.
5. EXTEND DEVICE TAPER ACROSS SHOULDER.
6. PCMS RECOMMENDED.
7. TRAFFIC SAFETY DRUMS RECOMMENDED FOR FREEWAY USE (IN LIEU OF CONES).
8. USE TRANSVERSE DEVICES IN CLOSED LANE EVERY 100' +-.



(SAMPLE MESSAGE)

PCMS	
1	2
RIGHT LANE CLOSED	1 MILE AHEAD
1.5 SEC	1.5 SEC

Field locate 1 mile +- in advance of lane closure.

CHANNELIZING DEVICE SPACING (FEET)		
MPH	TAPER	TANGENT
50/70	40	80
40/45	30	60

LEGEND

- N SIGN LOCATION
- >>> SEQUENTIAL ARROW SIGN
- □ □ TEMPORARY TRAFFIC CONTROL DEVICES
- PROTECTIVE VEHICLE - RECOMMENDED
- PCMS PORTABLE CHANGEABLE MESSAGE SIGN

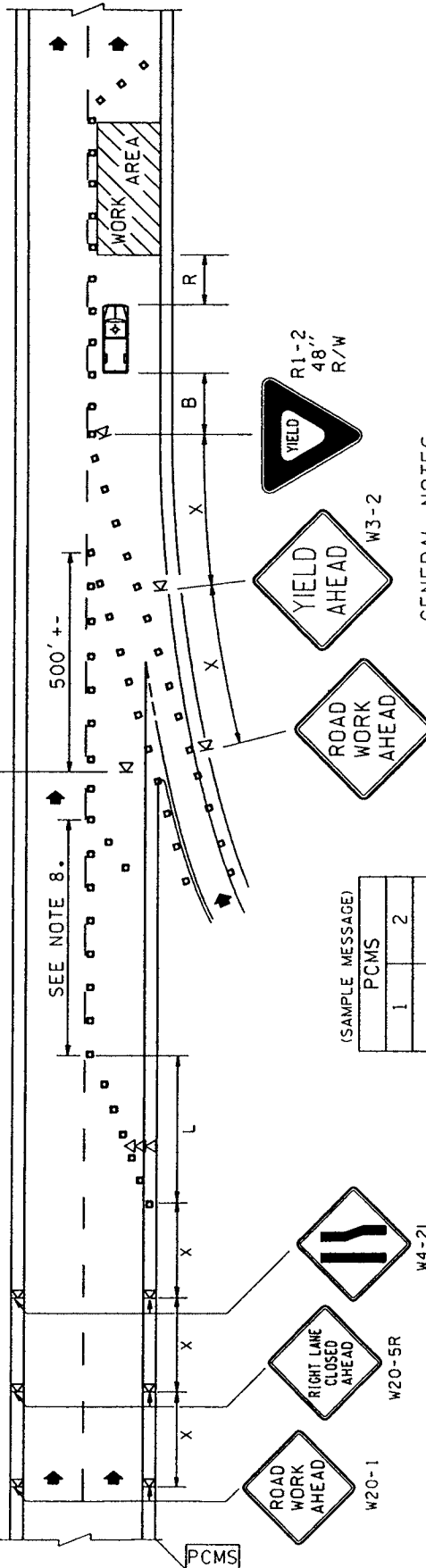
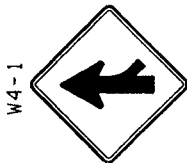
TEMPORARY OFF-RAMP FOR MULTI-LANE FREEWAYS
TC 5

BUFFER DATA										
BUFFER SPACE = B										
SPEED (MPH)	25	30	35	40	45	50	55	60	65	70
LENGTH (feet)	—	—	—	170	220	280	335	415	485	585
PROTECTIVE VEHICLE ROLL AHEAD DISTANCE = R*										
VEHICLE TYPE	TYPICAL VEHICLE LOADED WEIGHT (LBS)	POSTED SPEED (mph)	STATIONARY OPERATION (feet)	• VALUES MAY BE REDUCED IN ACCORDANCE WITH TMA USE, SEE PAGE 5.						
4 YARD DUMP TRUCK	24,000	60-70	100	75	50	45	40	35	30	25
2 TON CARGO TRUCK	15,000	60-70	150	100	75	50	45	40	35	30
1 TON CARGO TRUCK	10,000	60-70	200	150	100	75	50	45	40	35
ROLL AHEAD STOPPING DISTANCE ASSUMES DRY PAVEMENT										
TMA - RECOMMENDED, SEE TABLE FOR APPLICATION PRIORITIES, PAGE 6.										

SIGN SPACING = X (FEET)	
Freeways & Expressways	1500'++ (OR AS PER MUTCD)
Rural Roads	500'++
Urban Arterials	350'++

MINIMUM TAPER LENGTH (L) IN FEET										
Lane Width (feet)	Posted Speed (mph)									
	25	30	35	40	45	50	55	60	65	70
10	—	—	—	265	450	500	550	—	—	—
11	—	—	—	295	495	550	605	660	—	—
12	—	—	—	320	540	600	660	720	780	840

CHANNELIZING DEVICE SPACING (FEET)		
MPH	TAPER	TANGENT
50/70	40	80
40/45	30	60



GENERAL NOTES

1. THE DESIRABLE RAMP OPENING WIDTH IS 14'.
2. A G20-2A END ROAD WORK SIGN SHOULD BE INSTALLED ABOUT 500 FEET BEYOND THE WORK AREA OR USE A DOWN STREAM TAPER.
3. CONTACT REGION TRAFFIC OFFICE STAFF FOR WORK HOURS.
4. PROTECTIVE VEHICLE RECOMMENDED - MAY BE A WORK VEHICLE.
5. EXTEND DEVICE TAPER ACROSS SHOULDER.
6. PCMS RECOMMENDED.
7. TRAFFIC SAFETY DRUMS RECOMMENDED FOR FREEWAY USE (IN LIEU OF CONES).
8. USE TRANSVERSE DEVICES IN CLOSED LANE EVERY 1000' +-.

W20-1

(SAMPLE MESSAGE)	
PCMS	
1	2
RIGHT LANE CLOSED	1 MILE AHEAD
1.5 SEC	1.5 SEC

Field locate 1 mile +-
in advance of lane closure.

LEGEND

- Δ SIGN LOCATION
- ➡➡➡ SEQUENTIAL ARROW SIGN
- □ □ TEMPORARY TRAFFIC CONTROL DEVICES
- ☐ PROTECTIVE VEHICLE - RECOMMENDED

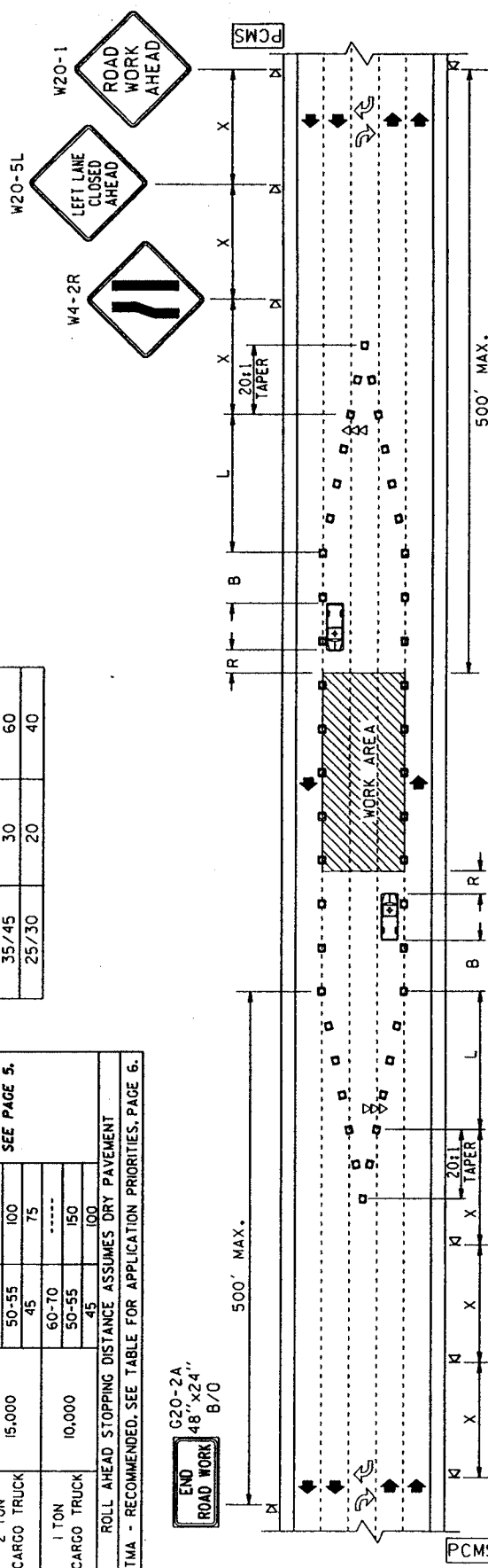
TEMPORARY ON-RAMP
(RIGHT LANE CLOSED)
TCP 8

BUFFER DATA												
BUFFER SPACE = B												
SPEED (MPH)	25	30	35	40	45	50	55	60	65	70		
LENGTH (feet)	55	85	120	170	220	280	335	—	—	—		
PROTECTIVE VEHICLE ROLL AHEAD DISTANCE = R*												
VEHICLE TYPE	TYPICAL VEHICLE LOADED WEIGHT (LBS)	POSTED SPEED (mph)	STATIONARY OPERATION (feet)	* VALUES MAY BE REDUCED IN ACCORDANCE WITH TMA USE. SEE PAGE 5.								
4 YARD DUMP TRUCK	24,000	60-70	----									
		50-55	75									
		45	50									
2 TON CARGO TRUCK	15,000	60-70	----									
		50-55	100									
		45	75									
1 TON CARGO TRUCK	10,000	60-70	----									
		50-55	150									
		45	100									
ROLL AHEAD STOPPING DISTANCE ASSUMES DRY PAVEMENT												
TMA - RECOMMENDED. SEE TABLE FOR APPLICATION PRIORITIES, PAGE 6.												

SIGN SPACING = X (FEET)		
Rural Roads	45/55 MPH	500'±
Urban Arterials	35/40 MPH	350'±
Rural Roads	25/30 MPH	200'±
Urban Streets Residential & Business Districts		
All signs are 48" x 48" black on orange unless otherwise designated		

CHANNELIZING DEVICE SPACING (FEET)		
MPH	TAPER	TANGENT
50/55	40	80
35/45	30	60
25/30	20	40

MINIMUM TAPER LENGTH = L (FEET)									
LANE WIDTH (feet)	25	30	35	40	45	50	55	60	65
10	105	150	205	270	450	500	550	—	—
11	115	165	225	295	495	550	605	—	—
12	125	180	245	320	540	600	660	—	—



(SAMPLE MESSAGE)	
1	2
CENTER LANE CLOSED	LIMITED TURNING
1.5 SEC	1.5 SEC

Field locate 1 mile +- in advance of lane closure.

GENERAL NOTES

1. PROTECTIVE VEHICLE RECOMMENDED - MAY BE A WORK VEHICLE.
2. CONTACT REGION TRAFFIC OFFICE STAFF FOR WORK HOURS.
3. MAINTAIN A MINIMUM OF ONE ACCESS POINT FOR EACH BUSINESS WITHIN WORK AREA LIMITS.

LEFT LANE AND CENTER TURN
LANE CLOSURE - 5 LANE ROADWAY
TCP 10

LEGEND

- ✕ SIGN LOCATION
- ➡ SEQUENTIAL ARROW SIGN
- TEMPORARY TRAFFIC CONTROL DEVICES
- 🚚 PROTECTIVE VEHICLE - RECOMMENDED
- 📢 PORTABLE CHANGEABLE MESSAGE SIGN

ROLLING SLOWDOWN

Traffic Control Plan (TCP) 12

A rolling slowdown is a legitimate form of traffic control commonly practiced by the WSP, contractors and highway maintenance people. Their use is valuable for emergency, or very short duration, closures (e.g. to pick debris from the roadway, to push a blocking disabled to the shoulder, or to pull power lines across the roadway). The traffic control vehicles form a moving blockade which reduces traffic speeds and creates a large gap in traffic, or clear area, allowing very short term work to be accomplished without totally stopping the traffic.

Other traditional forms of traffic control should be considered first. If the closure is to be a scheduled operation, then the Regional Traffic Office needs to be contacted to request a site specific, approved, Traffic Control Plan (TCP). The gap in traffic created by the rolling slowdown, and other traffic issues, would be addressed on an approved TCP. Also, use of WSP is encouraged whenever possible.

In the event of debris in the roadway, a blocking disabled vehicle, or other emergency, the use of experience and resources at hand, along with sound judgment and common sense, will suffice in lieu of an approved, site specific, TCP. TCP 12 on page 28 has been designed to present the basic information for performing a safe and effective rolling slowdown.

Equipment availability is a prime consideration. Before starting this operation, ensure there is at least one traffic control vehicle (with flashing amber lights) per lane to be slowed, and one vehicle to cover every point of access onto the 'rolling slowdown' segment of roadway. (Only during emergencies should less than one traffic control vehicle per lane be considered.) Truck mounted PCMS boards stating "Rolling Slowdown In Progress" are very helpful. **Be sure that every crew member participating is well briefed and knows what is needed from them. Good communications for this operation are essential!**

The traffic control vehicles leading the rolling slowdown must enter the roadway far enough upstream from the work operation site to allow a clear area in front of them to develop. The traffic control vehicles will work into position so that each lane is controlled. As in every other form of traffic control, sight distance is important, so that drivers are not surprised. While traveling at a fixed and reduced rate of speed, a gap in traffic must be created which is long enough to provide the estimated time needed for the work to be done.

A separate traffic control vehicle, "chaser vehicle", shall follow the slowest, or last, vehicle ahead of the blockade. When that last vehicle passes, the crew can begin the work operation.

All ramps and entrances to the roadway between the moving blockade and work operation must be temporarily closed using traffic control personnel. Each of those ramps must remain closed until the "all clear" signal is given by the crew doing the work, or, until the front of the moving blockade passes the closed on-ramp(s).

Radio communications between the work crew and the moving blockade are needed so the speed of the blockade can be adjusted, if necessary, to increase or decrease the closure time. Release traffic only after you have confirmation that all workers and their vehicles are clear of the roadway.

MOBILE WORK ZONES

Traffic Control Plans (TCP's) 13 to 20

Mobile work zones are used for work activities that move along the road either intermittently or continuously. Frequent short stops, up to 15 minutes long, may be used for pothole patching, litter cleanup, herbicide spraying, lane marker replacement or other similar operations. Cones, truck mounted signs or Portable Changeable Message Signs (PCMS), warning lights and flaggers may be needed for these operations.

Mobile work zones also include slow moving operations where workers and equipment move along the road without stopping. Operations such as sweeping and paint striping are typical mobile operations. The warning signs move ahead with the work, usually mounted on a shadow vehicle. Truck mounted signs or PCMS, Truck Mounted Attenuator (TMA) and warning lights are some of the devices that may be used for moving operations. Messages for truck mounted PCMS's should conform to standard work messages whenever possible. Contact the Region Traffic Office Staff for assistance with selecting appropriate messages.

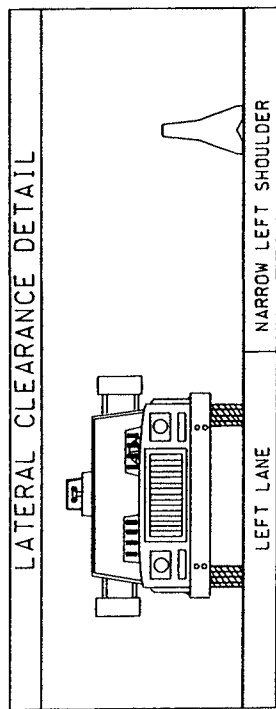
Mobile work zones are well suited to maintenance operations and can be an efficient way to accomplish many types of work, but due to the moving nature of these operations it is imperative that the crew is carefully coordinated. Careful consideration of traffic and roadway conditions as they relate to the specific operation must be done prior to starting work.

The following TCP's show typical examples of mobile work zones.

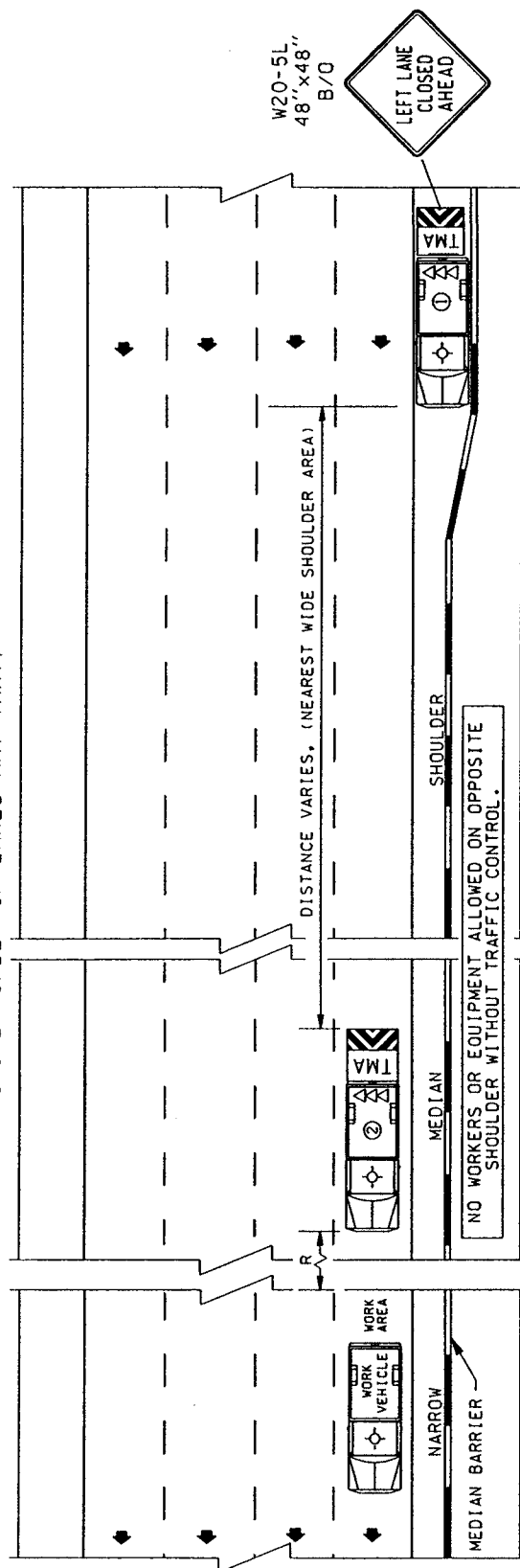
PROTECTIVE VEHICLE ROLL AHEAD DISTANCE = R*			
VEHICLE TYPE	VEHICLE WEIGHT (LBS)	STATIONARY	MOBILE
4 YARD DUMP TRUCK	24,000	100'	175'
ROLL AHEAD STOPPING DISTANCE ASSUMES DRY PAVEMENT * VALUES MAY BE REDUCED IN ACCORDANCE WITH TMA USE, SEE PAGE 5. TMA - RECOMMENDED, SEE TABLE FOR APPLICATION PRIORITIES, PAGE 6.			

(SAMPLE MESSAGE)			
PCMS			
1	2		
LEFT LANE CLOSED	MERGE RIGHT		
1-5 SEC	1-5 SEC		

Field locate in advance of lane closure.
(TRUCK MOUNTED OR TRAILER MOUNTED OPTIONAL)



TYPICAL FREEWAY APPLICATION (ACTUAL NUMBER OF LANES MAY VARY)



OPERATIONAL NOTES

1. SHADOW VEHICLE #1, MOUNT LANE CLOSURE SIGN ON BACK OF VEHICLE. DO NOT OBSCURE SEQUENTIAL ARROW PANEL. MAINTAIN 1000' TO 1500' OF SIGHT DISTANCE TO APPROACHING TRAFFIC (TMA RECOMMENDED).
2. PROTECTIVE VEHICLE #2, POSITION VEHICLE TO PROVIDE PROTECTION OF CREW. MAINTAIN MINIMUM ROLL AHEAD DISTANCE (TMA RECOMMENDED).
3. 2' MINIMUM CLEARANCE REQUIRED BETWEEN LANE EDGE AND WORK VEHICLE. ADJACENT LANE MUST BE CLOSED IF ADDITIONAL CLEARANCE IS REQUIRED OR IF WORK ACTIVITIES ADVERSELY INFLUENCE TRAFFIC.
4. CONTACT OLYMPIC RADIO AT 253-536-6089 OR SEATTLE RADIO AT 206-440-4490 OR THE INDIVIDUAL REGION RADIO PRIOR TO WORK BEGIN AND END.

LEGEND

➡➡➡ SEQUENTIAL ARROW PANEL - TYPE "B" MIN.

TMA TRUCK MOUNTED ATTENUATOR

⚠ WARNING BEACON

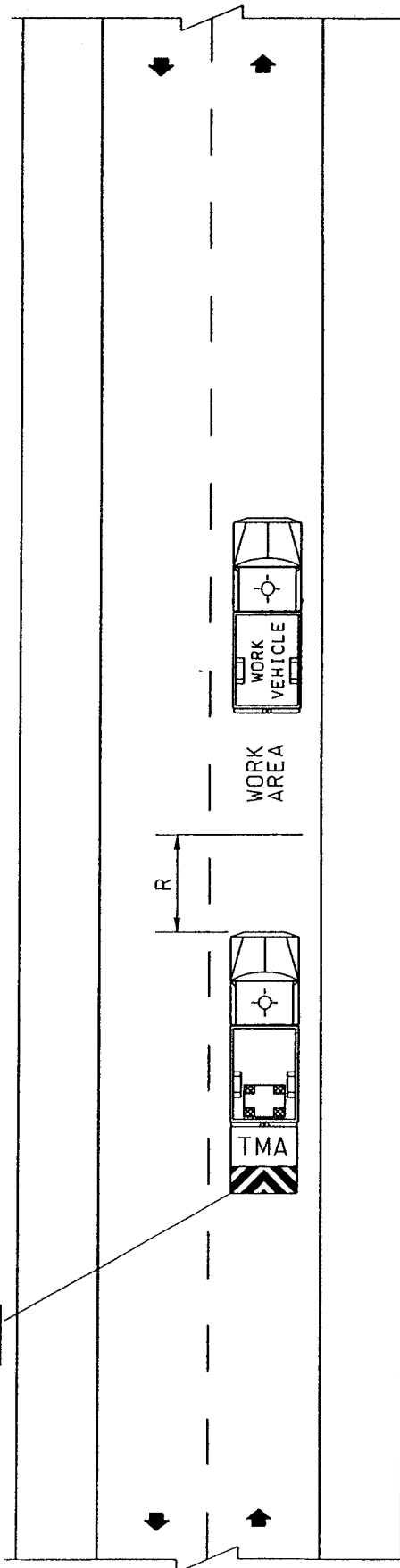
MOBILE FREEWAY OPERATION
LEFT LANE CLOSURE
TCP 14

PROTECTIVE VEHICLE ROLL AHEAD DISTANCE = R*			
VEHICLE TYPE	VEHICLE WEIGHT (LBS)	STATIONARY	MOBILE
4 YARD DUMP TRUCK	24,000	100'	175'
ROLL AHEAD STOPPING DISTANCE ASSUMES DRY PAVEMENT			
* VALUES MAY BE REDUCED IN ACCORDANCE WITH TMA USE, SEE PAGE 5.			
TMA - RECOMMENDED. SEE TABLE FOR APPLICATION PRIORITIES, PAGE 6.			

R4-1
36"X48"
B/W
(OPTIONAL)
MOUNT ON
PROTECTIVE
VEHICLE

DO
NOT
PASS

2 LANE HIGHWAY TYPICAL OPERATION



OPERATIONAL NOTES

1. WORK VEHICLE AND PROTECTIVE VEHICLE SHALL USE WARNING BEACONS.
2. PROTECTIVE VEHICLE SHALL MAINTAIN 500'-1000' OF SIGHT DISTANCE TO APPROACHING TRAFFIC.
3. CONTACT REGION TRAFFIC OFFICE STAFF FOR ASSISTANCE WITH SPECIFIC IN LANE OPERATIONS SUCH AS STRIPING, FOG SEAL, ETC. THAT REQUIRE ADDITIONAL PLAN DETAILS.
4. THIS PLAN MAY BE IMPLEMENTED ON MULTI-LANE HIGHWAYS WITH LESS THAN 10,000 ADT.

LEGEND

SEQUENTIAL ARROW PANEL - TYPE "B"
(CAUTION MODE)

TRUCK MOUNTED ATTENUATOR

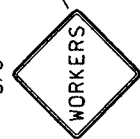
MOBILE OPERATION
LANE CLOSURE
TCP 16



SIGHT DISTANCE DATA MIN. STOPPING SIGHT DIST. = S									
SPEED LIMIT MPH	25	30	35	40	45	50	55	60	65
DISTANCE FEET	75'	100'	150'	225'	300'	375'	450'	550'	650'

DISTANCES SHOWN ARE MINIMUMS. USE ADDITIONAL DISTANCE WHEN POSSIBLE.

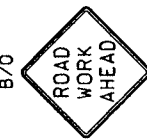
W21-1
48"X48"
B/O



MOUNT TO BACK OF WORK VEHICLE

SHADOW VEHICLE MAINTAIN MIN. SIGHT DISTANCE
"S" (SEE CHART) TO APPROACHING TRAFFIC.

W20-1
48"X48"
B/O



MOUNT TO BACK
OF SHADOW VEHICLE

OR

(SAMPLE MESSAGE)	
PCMS	
1	2
WORKERS	BE
ON	PREPARED
ROADWAY	TO STOP
1.5 SEC	1.5 SEC

TRUCK MOUNTED PCMS

LEGEND



WORK VEHICLE WITH FLASHING AMBER WARNING BEACON



SHADOW VEHICLE WITH FLASHING AMBER WARNING BEACON
(TMA RECOMMENDED, BUT NOT REQUIRED)

GENERAL NOTES

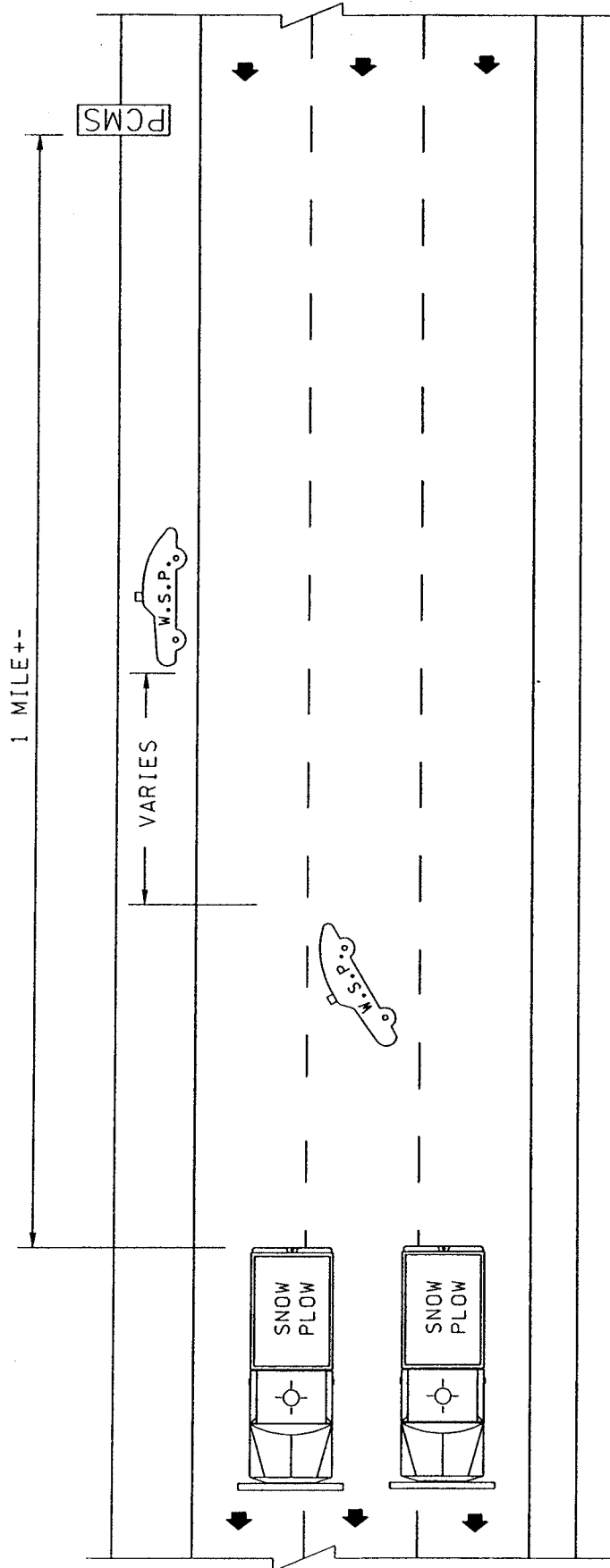
1. DAYLIGHT HOURS ONLY.
2. RADIO CONTACT BETWEEN WORK CREW AND SHADOW VEHICLE RECOMMENDED.

MOBILE SHOULDER OPERATION WITH LANE ENCROACHMENT
(RECOMMENDED FOR RURAL ROADWAYS WITH LESS THAN 10,000 ADT)
TCP 18

(SAMPLE MESSAGE)

PCMS	
1	2
AVALANCHE CONTROL AHEAD	PREPARE TO STOP
1.5 SEC	1.5 SEC

FIELD LOCATE 1 MILE (++) IN
ADVANCE OF LANE CLOSURE

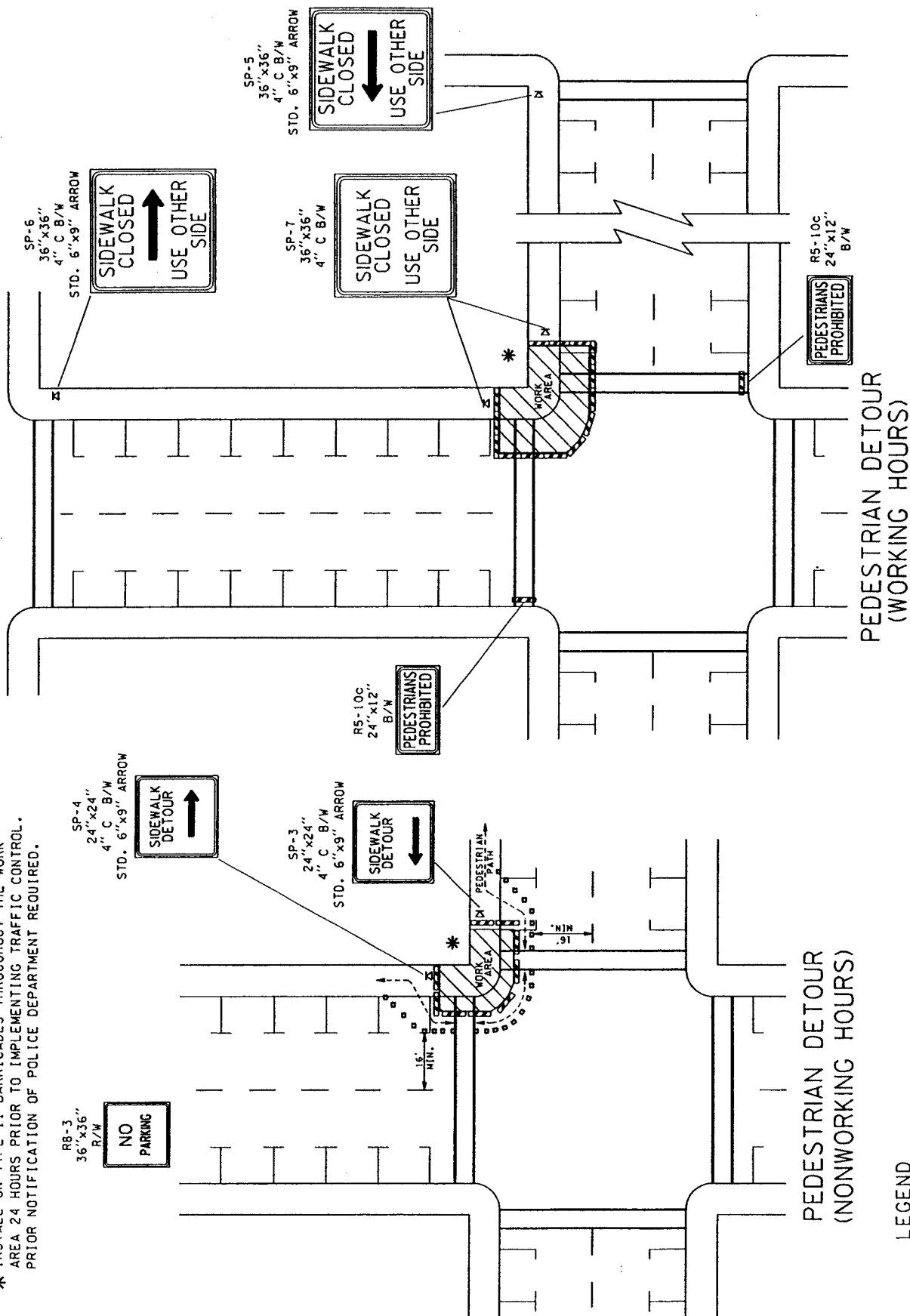


OPERATIONAL NOTES

1. WORK VEHICLES SHALL USE WARNING BEACONS.
2. REFER TO MAINTENANCE MANUAL CHAPTER 8 SNOW AND ICE CONTROL, FOR OPERATIONAL REQUIREMENTS.
3. PCMS RECOMMENDED.
4. W.S.P. ASSISTANCE RECOMMENDED.

AVALANCHE CONTROL OPERATION
TOTAL ROAD CLOSURE
TCP 20

* INSTALL ON TYPE II BARRICADES THROUGHOUT THE WORK AREA 24 HOURS PRIOR TO IMPLEMENTING TRAFFIC CONTROL. PRIOR NOTIFICATION OF POLICE DEPARTMENT REQUIRED.



LEGEND

▣ SIGN LOCATION

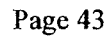
▣ TEMPORARY TRAFFIC CONTROL DEVICES

▣ TYPE II BARRICADE

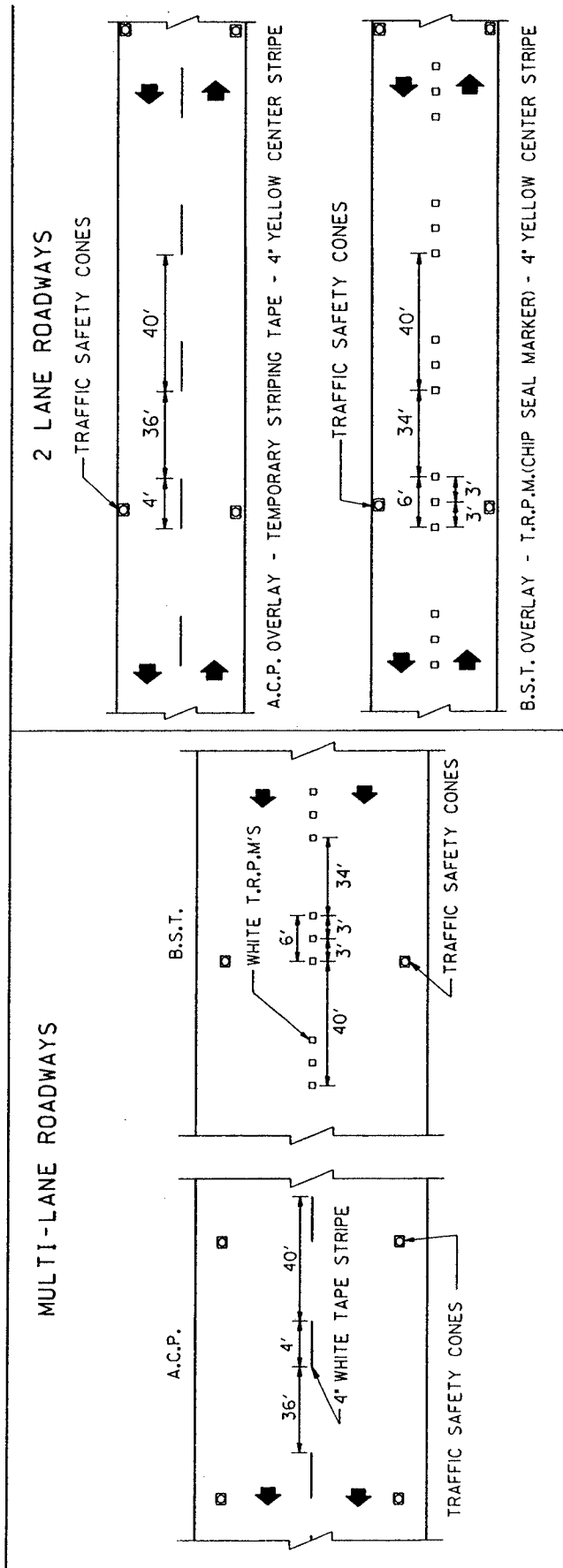
GENERAL NOTES

INTERSECTION PEDESTRIAN TRAFFIC CONTROL

1. CONTROLS SHOWN ARE FOR PEDESTRIAN TRAFFIC ONLY.
2. USE WARNING LIGHTS ON BARRICADES.



WORK OPERATIONS THAT REMOVE OR OBSCURE EXISTING PAVEMENT MARKINGS MUST PROVIDE FOR TEMPORARY MARKINGS UNTIL THE PERMANENT MARKINGS ARE APPLIED. PERMANENT MARKINGS SHALL BE INSTALLED WITHIN 2 WEEKS. THE DETAILS BELOW SHOW SOME COMMON APPLICATIONS. CONTACT THE REGION TRAFFIC OFFICE STAFF FOR ASSISTANCE WITH MORE COMPLEX SITUATIONS.



TEMPORARY EDGE STRIPES ARE NOT REQUIRED FOR THE ABOVE SITUATIONS. TEMPORARY ROADSIDE DELINEATION WITH CHANNELIZATION DEVICES SHOULD BE CONSIDERED, BUT ARE OPTIONAL. DO NOT USE A "SKIP" PATTERN OF TAPE STRIPE OR T.R.P.M.'S TO SIMULATE AN EDGE STRIPE.

CHANNELIZATION DEVICE SPACING - TANGENT 200' +-
CURVES 100' +-
TAPERS 1/2 L

T.R.P.M. = TEMPORARY RAISED PAVEMENT MARKER

TEMPORARY PAVEMENT MARKING DETAILS
TCD 1

TCP REFERENCE CHART

FOR SELECTED WORK OPERATIONS

WORK OPERATION	STATIONARY AND SHORT DURATION	MOBILE	SUGGESTED TRAFFIC CONTROL PLAN*
Re-lamp		X	13 & 17
Light Standard Repair	X		2, 4, & 5
Rewire	X		2, 4, & 5
VACTOR		X	13 & 17
Sweeping		X	13 & 17
Striping		X	14, 15 & 16
RPM's		X	14, 15 & 16
Sign Installation	X	X	4, 5, & 14
Pot Hole Repair	X	X	1, 2, & 14
Paving / Chip Seal	X		1, 2, & TCD 4
Bridge Inspection	X	X	2, 13, & 14
EMERGENCY	X	X	24

LEGEND

X=Applies

Definitions:

Stationary----- Operation longer than 1 hour.
 Short Duration----- Operations of 60 minutes or less.
 Mobile----- Frequent short stops up to 15 minutes or continuously slow moving.
 Emergency----- Mobile to Stationary, but unexpected (Call for traffic control if work is expected to last longer than 60 minutes. This allows for 60 minutes as a short duration operation while traffic control assistance arrives).

* Others may apply, or a site specific plan may be appropriate.

TCP REFERENCE CHART
TCD 3

Notes

Modifications

to the

MUTCD 2000



Washington State Department of Transportation

WAC 468-95-300, Temporary Traffic Control

Amend MUTCD Section 6C.4, Table 6C-1 and MUTCD Section 6H.01, Table 6H-3 to read:

Sign Spacing (1)

Freeways & Expressways	55/70 MPH	1500 +/- or per MUTCD
Rural Highways	60/65 MPH	1000' +/-
Rural Roads	45/55 MPH	500' +/-
Rural Roads & Urban Arterials	35/40 MPH	350' +/-
Rural Roads, Urban Streets, Residential Business Districts	25/30 MPH	200' /- (2)
Urban Streets	25 MPH or Less	100' +/- (2)

1. All spacing may be adjusted to accommodate interchange ramps, at-grade intersections, and driveways.
2. This spacing may be reduced in urban areas to fit roadway conditions.

WAC 468-95-310, Temporary Pavement Markings

Amend the first Support of MUTCD Section 6F.66 to read:

Temporary pavement markings are those that may be used until it is practical and possible to install permanent pavement markings that meet MUTCD standards. Normally, it should not be necessary to leave temporary pavement markings in place for more than 2 weeks, except on roadways being paved with bituminous surface treatment (BST) and having traffic volumes under 2,000 ADT. All temporary pavement markings, including pavement markings for no-passing zones, shall conform to the requirements of sections 3A and 3B.

Amend the first Guidance of MUTCD Section 6F.66 to read:

For temporary situations of 14 calendar days or less, for a two-lane or three-lane road, no-passing zones may be identified by using W 14-3 N Passing Zone signs (see Section 2C.32) rather than pavement markings (See Section 3B.02). Signs may also be used in lieu of pavement markings on low-volume roads for longer periods, when this practice is in keeping with the state's or other highway agency's policy. These signs should be placed in accordance with Sections 2B.2 and 2B.35.

Quick References

Page 1 – (M54-44, Page 13) Taper and Buffer Space Details

Page 2 – (Finding “L” Chart)

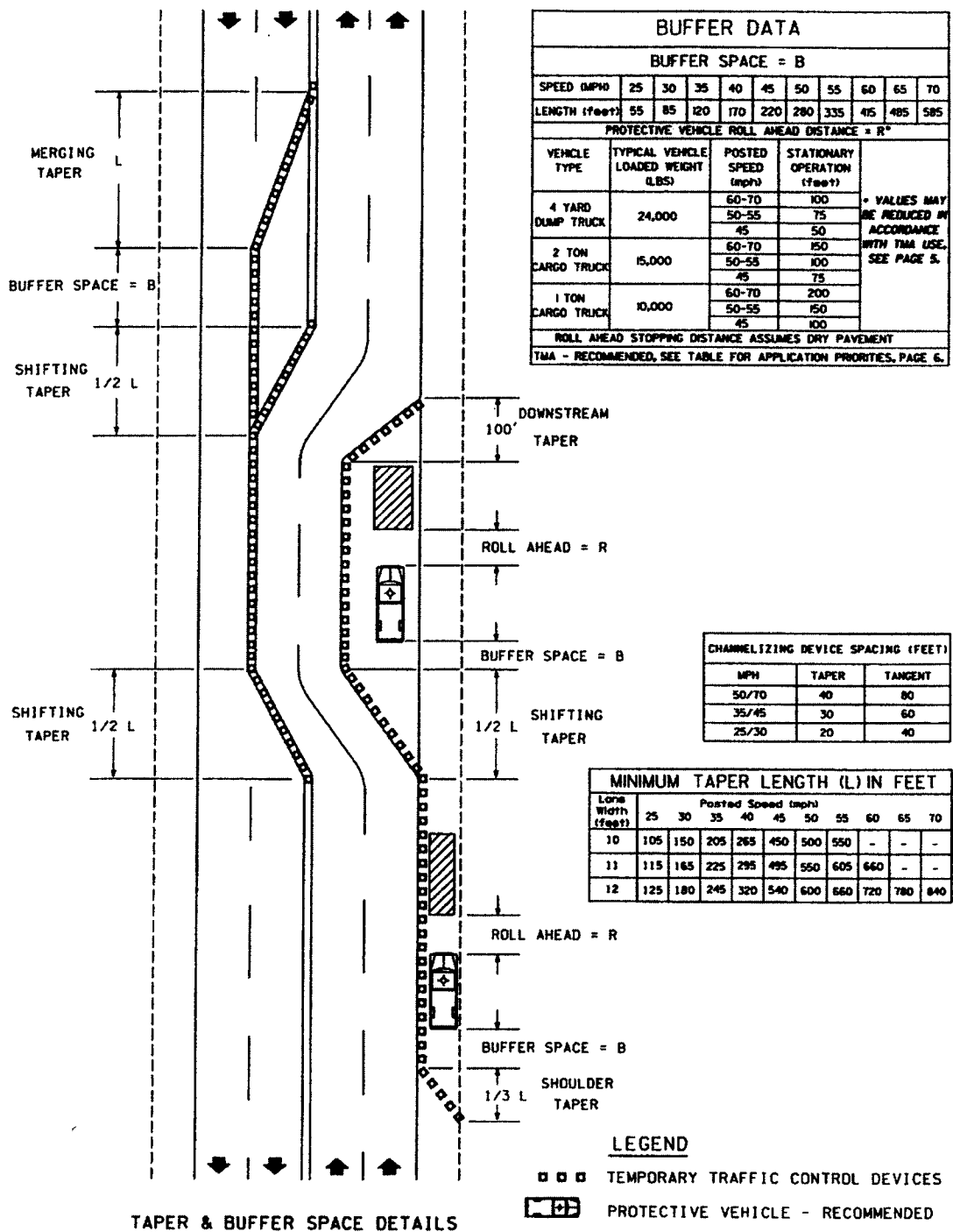
Page 3 – (M54-44, Page 14) Taper/Device Table, also page 6-8 in this book

Page 4 – (MUTCD2000, Figure 6C-1) also page 6-2 in this book

Page 5 – (Page 6-5) Suggested Distance Between Signs

Page 6 – (Page 6-14) Channelizing Device Spacing

TAPER AND BUFFER SPACE DETAILS



FINDING "L"

Finding "L" Chart												
(Merging Taper)												
OFFSET/LANE WIDTH												
S P E E D M P H		2	3	4	5	6	7	8	9	10	11	12
	20	15	20	30	35	40	50	55	60	70	75	80
	25	25	35	45	55	65	75	85	95	105	115	125
	30	30	45	60	75	90	105	120	135	150	165	180
	35	45	65	85	105	125	145	165	185	205	225	245
	40	55	80	110	135	160	190	215	240	270	295	320
	45	90	135	180	225	270	315	360	405	450	495	540
	50	100	150	200	250	300	350	400	450	500	550	600
	55	110	165	220	275	330	385	440	495	550	605	660
	60	120	180	240	300	360	420	480	540	600	660	720
	65	130	195	260	325	390	455	520	585	650	715	780
	70	140	210	280	350	420	490	560	630	700	770	840

TAPER/CHANNELIZING DEVICE TABLE

MERGING, SHIFTING AND SHOULDER TAPER LENGTHS AND NUMBER OF CHANNELIZATION DEVICES USED

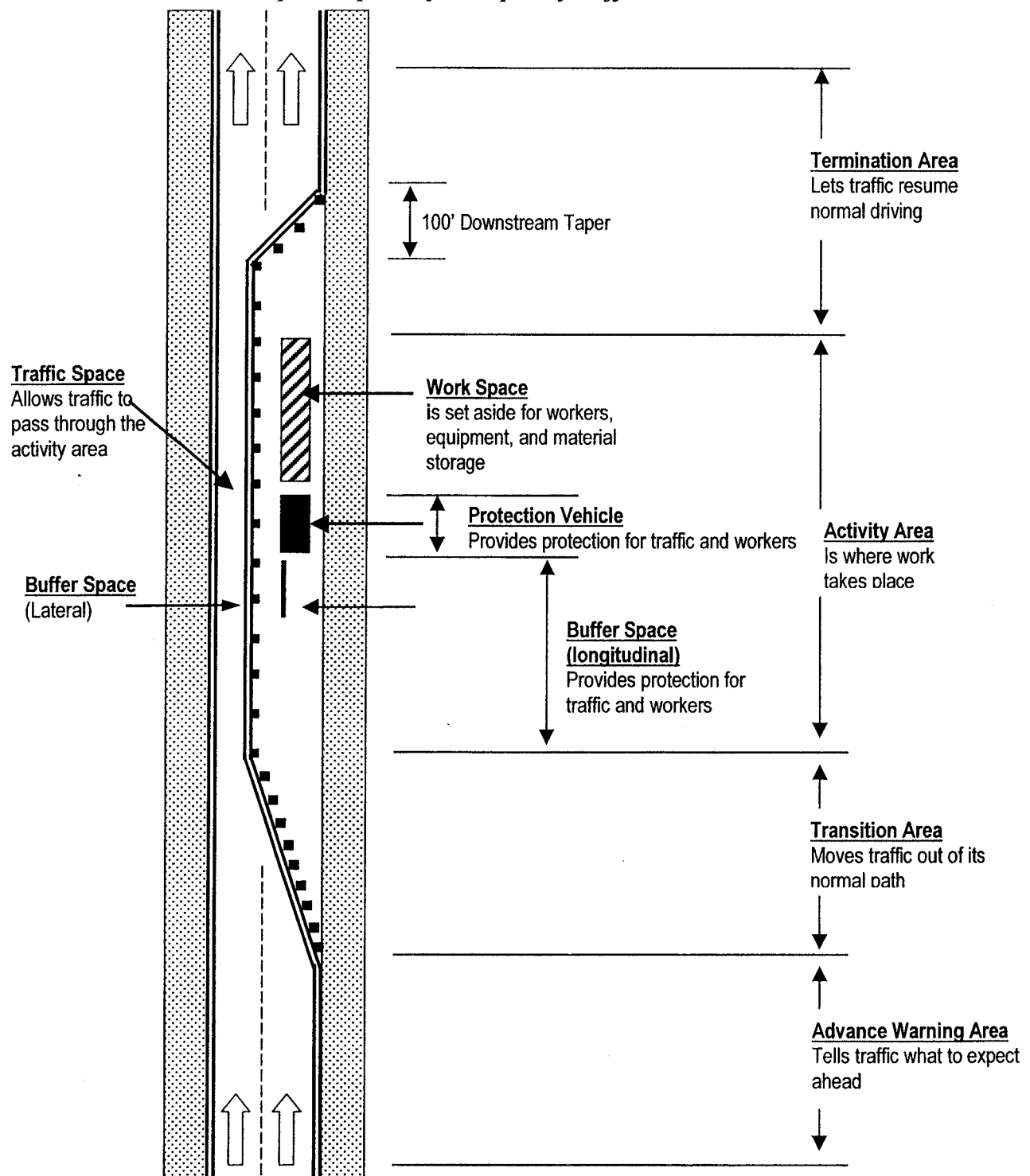
(Washington State Department of Transportation)

(All minimums)

Lane Width	10 Feet				11 Feet				12 Feet				Shoulder Tapers (Assumes 10' Shoulders)		
	L		1/2L		L		1/2L		L		1/2L		*1/3L		
MPH	Merging	Devices	Shifting	Devices	Merging	Devices	Shifting	Devices	Merging	Devices	Shifting	Devices	MPH	(ft) Length	Devices
20	70	5	35	3	75	5	40	3	80	5	40	3	20	25	3
25	105	6	55	4	115	7	60	4	125	7	65	4	25	35	3
30	150	8	75	5	165	9	85	5	180	10	90	5	30	50	3
35	205	8	105	5	225	9	115	5	245	9	125	5	35	70	4
40	270	10	135	6	295	11	150	6	320	12	160	6	40	90	4
45	450	16	225	9	495	18	250	9	540	19	270	10	45	150	6
50	500	14	250	8	550	15	275	8	600	16	300	9	50	170	6
55	550	15	275	8	605	16	305	9	660	18	330	9	55	185	6
60	600	16	300	9	660	18	330	9	720	19	360	10	60	220	6
65	650	17	325	9	715	19	370	10	780	21	390	11	65	220	7
70	700	19	350	10	770	20	385	11	840	22	420	12	70	235	7
													*L for shoulder taper equals Shoulder Width x Speed. Figures shown are for a 10' Shoulder		

FIGURE 6C-1, MUTCD 2000

Component parts of a temporary traffic control zone



WAC 468-95-300, WSDOT Amendments to the MUTCD

Road Type	Speed	Distance Between Signs			
		A	B	B'	C
Freeways & Expressways	55/70 mph	1500'	1500'	1500'	1500'
		(or per MUTCD)			
Rural Highways	60/65 mph	1000'	1000'	1000'	1000'
Rural Roads	45/55 mph	500'	500'	500'	500'
Rural Roads & Urban Arterials	35/40 mph	350'	350'	350'	350'
Rural Roads, Urban Streets, Residential Business Districts	25/30 mph	200'	200'	200'	200'
		(see note 2)			
Urban Streets	25 mph or less	100'	100'	100'	100'

(1) All spacing may be adjusted to accommodate interchange ramps, at-grade intersections, and driveways.

(2) This spacing may be reduced in urban areas to fit roadway conditions.

WAC 296-155-305, L&I Rules, required when Flaggers are present!

		A	B	C	D
Urban low speed*	25/30 mph	200'	200'	200'	200'
Urban high speed*	35/40 mph	350'	350'	350'	350'
Rural	45/55 mph	500'	500'	500'	500'
Expressways/Freeways	55/65 mph	1000'	1600'	2600'	2600'

* Speed category to be determined by Washington State Department of Transportation in cooperation with local jurisdictions.

BUFFER DATA										
BUFFER SPACE = B										
SPEED (MPH)	25	30	35	40	45	50	55	60	65	70
LENGTH (FT)	55	85	120	170	220	280	335	415	485	585
PROTECTIVE VEHICLE ROLL AHEAD DISTANCE = R*										
VEHICLE TYPE	TYPICAL VEHICLE LOADED WEIGHT (LBS)		POSTED SPEED (MPH)		STATIONARY OPERATION (FT)		*VALUES MAY BE REDUCED IN ACCORDANCE WITH TMA USE. SEE PAGE 5			
4 YARD DUMP TRUCK	24,000		60-70		100					
			50-55		75					
			45		50					
2 TON CARGO TRUCK	15,000		60-70		150					
			50-55		100					
			45		75					
1 TON CARGO TRUCK	10,000		60-70		200					
			50-55		150					
			45		100					
ROLL AHEAD STOPPING DISTANCE ASSUMES DRY PAVEMENT										
TMA – RECOMMENDED, SEE TABLE FOR APPLICATION PRIORITIES, PAGE 5-15										

CHANNELIZING DEVICE SPACING

* WSDOT Channelizing Device Spacing (feet)

Merging/Shifting/Shoulder tapers

MPH	Taper	Tangent
50/70	40	80
35/45	30	60
25/30	20	40

One-Lane, Two-Way/Flagger taper

Approximately 20 feet

Downstream or Termination taper

Approximately 20 feet

WA FACE Listing of Work Zone Fatalities - as of June 12, 2002

I N C I D E N T	Jurisdiction		C A S E #	S I C	W I S H A T *	Type of work	Vehicle Intrusion	NARRATIVE
6/10/02	02WA03401	1711	<input checked="" type="checkbox"/>	<input type="checkbox"/>	ROAD CONSTRUCTION	<input checked="" type="checkbox"/>		CONSTRUCTION WORKER STRUCK BY PICKUP
A CONSTRUCTION COMPANY FOREMAN WAS STANDING IN A THREE FOOT TRENCH A PUBLIC ROADWAY WORKING ON A NATURAL GAS LINE. A PICKUP TRUCK DROVE IN THROUGH A SERIES OF ORANGE CONES AND STRUCK HIM AND A FLAGGER								
BEFORE THE FLAGGER SUSTAINED INJURIES AND WAS HOSPITALIZED.								
4/18/02	02WA02601	1794	<input checked="" type="checkbox"/>	<input type="checkbox"/>	OTHER	<input type="checkbox"/>		EXCAVATION COMPANY OWNER RUN OVER BY RUNAWAY TRUCK
THE OWNER OF AN EXCAVATION COMPANY WORKING ON A RETAINING WALL WAS KILLED TRYING TO STOP A DRIVERLESS TRUCK. THE VICTIM AND AN EMPLOYEE HAD LOADED AN INDUSTRIAL SHOVEL ONTO THE SEMITRAILER ATTACHED TO THE TRUCK WHEN THE RIG'S BRAKES FAILED. THE TRUCK BEGAN ROLLING DOWNHILL, ROLLED OVER THE VICTIM, AND TOPPLED POWERLINES BEFORE COMING TO REST AT THE BOTTOM OF THE SLOPE								
12/5/01	01WA08201	1611	<input checked="" type="checkbox"/>	<input type="checkbox"/>	OTHER	<input type="checkbox"/>		CONSTRUCTION WORKER STRUCK BY CAR
AT A CONSTRUCTION SITE THE OPERATOR OF A BACKHOE LEFT HIS MACHINE TO DIRECT A DUMP TRUCK BACKING ONTO A ROADWAY. HE WAS NOT WEARING REFLECTIVE CLOTHING, NOR WAS HE USING A "STOP" SIGN AS TYPICALLY USED BY FLAGGERS. HE WAS STRUCK BY A PASSING VEHICLE ON THE ROADWAY. THE VICTIM WORKED FOR A PRIVATE CONSTRUCTION COMPANY THAT HAULING DIRT FROM A MUDSLIDE THAT HAD BLOCKED A ROADSIDE DITCH. WAS								
11/6/01	01WA07901	1794	<input type="checkbox"/>	<input type="checkbox"/>	UTILITIES	<input type="checkbox"/>		PINNED UNDER BACKHOE
THE VICTIM WAS USING A BACKHOE TO EXCAVATE AN AREA TO BE USED FOR A SEPTIC SYSTEM. HE WAS BACKING UP A STEEP EMBANKMENT WHEN THE BACKHOE WENT SIDEWAYS. HE TRIED TO JUMP CLEAR BUT WAS PINNED UNDER THE CAB WHEN IT ROLLED ONTO HIM.								

I N C I D E N T I F I C A T I O N	Jurisdiction			Type of work	Vehicle Intrusion	NARRATIVE
	W I M S U H L A T S I C	C A S E #	4911			
						UTILITY LINEMAN STRUCK BY AUTOMOBILE
7/25/00	00WA04001	4911	<input checked="" type="checkbox"/> UTILITIES	<input checked="" type="checkbox"/>		INSTALLING A POWER POLE AT A ROAD INTERSECTION. THE DRIVER OF THE INJURED WORKERS WERE SENT TO A HOSPITAL WHERE ONE WAS RELEASED THE DRIVER WAS UNDER THE INFLUENCE OF ALCOHOL.
						CATERPILLAR TRACTOR COMPACTOR ROLLOVER
6/22/00	00WA03101	1629	<input checked="" type="checkbox"/> BUILDING CONSTRUCTION	<input type="checkbox"/>		WHEN THE LEFT REAR WHEEL DROPPED OFF THE EDGE OF AN 8 FOOT HIGH SIDE. THE OPERATOR, WHO WAS NOT WEARING A SEAT BELT, SUFFERED FATAL CRUSHING INJURIES OF THE TRUNK.
						TRAFFIC FLAGGER STRUCK BY AUTO IN HIGHWAY WORK ZONE
2/22/00	00WA01101	9621	<input checked="" type="checkbox"/> ROAD CONSTRUCTION	<input checked="" type="checkbox"/>		KILLED BY A PASSING AUTOMOBILE.
						TRAFFIC FLAGGER RUN OVER BY DUMP TRUCK
10/18/99	99WA07001	1442	<input checked="" type="checkbox"/> ROAD CONSTRUCTION	<input type="checkbox"/>		INTO HER.
						PEDESTRIAN RUN OVER BY TRUCK
10/3/99	99WA06501	1771	<input checked="" type="checkbox"/> ROAD CONSTRUCTION	<input type="checkbox"/>		OF A TRUCK BACKING UP AND WAS RUN OVER. THE INCIDENT OCCURRED AT A WORK SITE WHERE THE WORKERS WERE RESURFACING ASPHALT.
						RUN OVER BY DUMP TRUCK
9/16/99	99WA05901	1611	<input checked="" type="checkbox"/> ROAD CONSTRUCTION	<input type="checkbox"/>		PULLED FORWARD AND RAN OVER HIM.

	1995	1996	1997	1998	1999	2000	TOTAL
<u>ACCIDENT SEVERITY</u>							
PROPERTY DAMAGE ONLY ACCIDENTS	1,371	1,252	1,752	894	909	844	7,022
INJURY ACCIDENTS	1,191	1,155	1,490	700	664	551	5,751
FATAL ACCIDENTS	8	8	15	12	8	6 ↓	57
TOTAL ACCIDENTS	2,570	2,415	3,257	1,606	1,581	1,404 ↓	12,833
NUMBER OF PERSONS INJURED	1,884	1,811	NA	NA	1,057	873	3,695
NUMBER OF PERSONS KILLED	9	8	NA	NA	9	6 ↓	17
<u>ALCOHOL INVOLVEMENT</u>							
DRIVER HAD BEEN DRINKING, ABILITY IMPAIRED	145	142	191	118	86	57 ↓	739
DRIVER HAD BEEN DRINKING, ABILITY NOT IMPAIRED	37	29	55	37	13	16 ↓	187
DRIVER HAD BEEN DRINKING, SOBRIETY UNKNOWN	28	26	37	18	7	1	117
DRIVER HAD NOT BEEN DRINKING	1,982	1,922	2,740	1,333	1,302	1,175	10,454
NOT STATED	378	296	234	100	173	152	1,333
<u>LEADING COLLISION TYPES</u>							
REARENDS	1,301	1,218	NA	NA	809	713	2,519
STRUCK FIXED OBJECT	386	362	NA	NA	223	192	748
SIDESWIPE, SAME DIRECTION	367	345	NA	NA	155	146	712
ENTERING AT ANGLE	124	84	NA	NA	89	90	208
OVERTURN	76	69	NA	NA	47	39	145
<u>LEADING FIXED OBJECTS STRUCK</u>							
CONCRETE BARRIER	131	154	NA	NA	72	71 ↓	285
GUARDRAIL	62	39	NA	NA	26	15	101
CRASH CUSHION	21	30	NA	NA	11	7	51
ROAD MACHINERY	13	14	NA	NA	19	31 ↑	27
TEMPORARY BARRICADE	26	15	NA	NA	21	15	41
<u>WEATHER CONDITIONS</u>							
CLEAR OR CLOUDY	2,079	1,922	NA	NA	1021	959	4,001
RAINING	476	451	NA	NA	283	194	927
SNOWING	10	28	NA	NA	5	23	38
FOGGY	5	14	NA	NA	9	9	19
<u>LIGHT CONDITIONS</u>							
DAYLIGHT	1,875	1,745	NA	NA	1149	977	3,620
DAWN	29	35	NA	NA	29	24	64
DUSK	55	36	NA	NA	53	42	91
DARK, STREET LIGHTS ON	362	314	NA	NA	238	251	676
DARK, NO STREET LIGHTS	249	285	NA	NA	93	86	534

PREPARED BY WASHINGTON DEPARTMENT OF TRANSPORTATION
TRANSPORTATION DATA OFFICE
ACCIDENT DATA SECTION

WASHINGTON STATE HIGHWAY ACCIDENTS OCCURRING IN WORK ZONES

	1995	1996	1997	1998	1999	2000	TOTAL
DAY OF WEEK							
MONDAY	390	377	449	255	238	201	1,910
TUESDAY	426	401	567	227	284	218	1,623
WEDNESDAY	460	407	555	288	263	254	1,717
THURSDAY	406	397	517	287	288	240	1,607
FRIDAY	403	411	536	246	262	241	1,596
SATURDAY	252	241	369	168	137	150	1,030
SUNDAY	233	181	264	135	109	97	813

MONTH							
JANUARY	142	135	187	107	68	92	571
FEBRUARY	127	144	189	123	73	94	583
MARCH	136	170	254	134	83	115	694
APRIL	169	206	259	144	74	78	930
MAY	215	187	291	128	91	90	1,002
JUNE	244	185	332	183	121	140	1,205
JULY	259	260	363	158	164	155	1,359
AUGUST	353	270	345	190	243	174	1,575
SEPTEMBER	322	260	355	155	208	162	1,462
OCTOBER	247	235	301	125	183	132	1,223
NOVEMBER	204	195	222	88	140	101	950
DECEMBER	151	168	159	71	133	68	750

HOUR DURING WHICH ACCIDENT OCCURRED							
12 TO 12:59 AM	54	39	50	37	34	27	180
1 TO 1:59 AM	46	38	43	25	19	17	150
2 TO 2:59 AM	31	24	49	26	14	19	130
3 TO 3:59 AM	15	23	31	14	13	13	83
4 TO 4:59 AM	16	22	16	15	10	14	69
5 TO 5:59 AM	33	36	60	19	26	27	201
6 TO 6:59 AM	75	68	101	51	41	33	496
7 TO 7:59 AM	138	125	171	62	84	70	496
8 TO 8:59 AM	130	121	166	79	82	60	417
9 TO 9:59 AM	94	115	139	69	72	57	500
10 TO 10:59 AM	117	126	171	86	77	88	600
11 TO 11:59 AM	174	158	191	77	113	101	663
12 TO 12:59 PM	184	169	218	92	114	102	724
1 TO 1:59 PM	167	179	250	128	118	121	723
2 TO 2:59 PM	182	173	232	136	120	88	747
3 TO 3:59 PM	192	198	242	115	120	87	760
4 TO 4:59 PM	211	178	263	108	134	102	706
5 TO 5:59 PM	219	150	218	119	106	82	452
6 TO 6:59 PM	130	115	139	68	70	67	330
7 TO 7:59 PM	93	79	107	51	38	52	275
8 TO 8:59 PM	68	58	93	56	50	52	321
9 TO 9:59 PM	76	84	104	57	43	48	325
10 TO 10:59 PM	62	79	114	70	40	41	258
11 TO 11:59 PM	63	60	89	46	43	32	

PREPARED BY WASHINGTON DEPARTMENT OF TRANSPORTATION
TRANSPORTATION DATA OFFICE
ACCIDENT DATA SECTION



**Washington State
Department of Transportation**

Contractor's Daily Report of Traffic Control - Summary

Page One

Contract Number _____ SR Number _____ Day _____ Date _____

Photos/Videos taken today for record? ☐ Yes ☐ No

If yes, note locations:

Summary of TCS Activities:

[illegible]

Contractor

Contractor's Traffic Control Supervisor's Signature

WSDOT Project Office Comments:	

To be Completed by Contractor's Traffic Control Supervisor (TCS)

DOT Form 421-040A
2.04

Distribution: White - Contractor Canary - Project Engineer



Washington State
Department of Transportation

Contractor's Daily Report of Traffic Control - Traffic Control Log

Use Separate Sheet for Each Setup
(May be altered to record Class A signs.)

Page _____

Contract Number _____ SR Number _____ Day _____ Date _____

Setup			
	Station	Time	
◇	—		◇
◇	—		◇
◇	—		◇
◇	—		◇
◇	—		◇

Work Area

◇	—		◇
◇	—		◇
◇	—		◇
◇	—		◇
◇	—		◇

↑ One Way Traffic
(one or more lanes)
↓ Two Way Traffic
(two or more lanes)

↑

Legend	
(List of Signs Used)	
◇ 1	_____
◇ 2	_____
◇ 3	_____
◇ 4	_____
◇ 5	_____
◇ 6	_____
◇ 7	_____
◇ 8	_____

Cones ☐ Yes ☐ No

Piloted ☐ Yes ☐ No

Per Approved Plan ☐ Yes ☐ No

Flagger(s)	Start	End

Contractor

Contractor's Traffic Control Supervisor's Signature

Type of Traffic Control	Time Set Up	Time(s) Checked	Time Removed

To be Completed by Contractor's Traffic Control Supervisor (TCS)

DOT Form 421-0428
Revised 10/96

Distribution: White - Contractor; Canary - Project Engineer

MEMORANDUM

To: Certified Traffic Control Supervisor Candidates

From: Traffic Control Supervisor Training Provider

Subject: Completing Your Certification Requirements

Besides attending this 3-day training session and achieving an 80% or better examination score, you must provide two letters confirming necessary work experience and a copy of your current flagger card.

Qualifying work experience is defined as at least one full year employment or 2000 work hours (achieved over multiple years) in traffic control related work which may include:

- Traffic control work on a survey crew
- Designing or reviewing traffic control plans
- Other specific traffic control experience (set-up and takedown)
- Some flagging experience

Be aware that the Evergreen Safety Council cannot issue your TCS card or certificate until we have received your two letters and a copy of your current flagger card.

If you have questions you may contact Tina Schlund or Randy Singer, at the Evergreen Safety Council, 1-800-521-0778. Please send all supporting information to their attention at 401 Pontius Avenue N., Seattle, WA 98109.

Please include the location and date of class with your verification material.

THANKS!

TRAFFIC CONTROL SUPERVISOR COURSE

PARTICIPANT INFORMATION

Please indicate if you are attending the class to be a Traffic Control Supervisor (TCS) or a Traffic Control Technician (TCT).

- ☐ A TCS is defined as someone who meets the minimum state requirements of one full year (2000 hrs) of traffic control related work and a current flagger certification card.
- ☐ A TCT is defined as someone who does not meet the required experience and is taking the class for informational purposes. A TCT must also have a valid flagger certification card.

The following information will be used to issue and send you your Certification Card and Certificate.
PLEASE PRINT LEGIBLY.

Class Date: _____ Course Location: _____

Name: _____

Identification Number: _____

Company Name: _____

Company Address: _____

City, State, Zip: _____

Home Address: _____

City, State, Zip: _____

Home Phone: _____ Work Phone: _____

Where Would You Like Your Mail Sent:

☐ Home

☐ Work

☐ Authorization To Release Information:

Initials: _____

☐ Please Do Not Release My Information:

TRAINING AGENCY USE ONLY:

1. Attended Work Zone Traffic Control Supervisor Course _____

2. Passed TCS Exam _____

3. Two References Of Acceptable Experience _____

4. Current Flagging Card (Expire Date) _____

TCS Certification # _____

Expire Date: _____

TCT Certification # _____

Expire Date: _____

**WASHINGTON STATE DEPARTMENT OF TRANSPORTATION
TRAFFIC CONTROL SUPERVISOR & TECHNICIAN
CERTIFICATION PROGRAM
EVALUATION**

Instructor: _____ Class Date: _____

City/Location: _____

Your Organization: _____

Supervisor New Certification
Technician New Certification

Re-certification
Re-certification

It is important in maintaining the quality of instructors and training program that we have an evaluation by the class participants. This evaluation should be returned to the instructor at the end of class. Your evaluation and comments are helpful in keeping the training responsive to your needs as a Traffic Control Supervisor/Technician.

Disagree	Somewhat Agree	Generally Agree	Strongly Agree
----------	----------------	-----------------	----------------

1. The Training Program:

- Purpose of class and work applications understood
- Manual - useful and easy to follow
- Traffic control skills will be improved by class experience
- I have learned or reinforced information important to public and employee safety

2. The Instructor:

- Presentation - clear, understandable, uses good examples.
- Organization - comfortable flow of information and use of material
- Facilitation - promotes questions, interaction, enthusiasm, maintains eye contact
- Exercises are helpful and reinforce learning

3. Overall rating of the course and instruction

COMMENTS (on above or other points):

Signature _____ (Optional)

NOTES:

This image shows a single page of white paper with horizontal ruling lines. The lines are evenly spaced and run across the width of the page. There is no handwriting or other markings on the paper.

TRAFFIC CONTROL SUPERVISOR/TECHNICIAN

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TRAFFIC CONTROL SUPERVISOR/TECHNICIAN

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TRAFFIC CONTROL SUPERVISOR/TECHNICIAN

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TRAFFIC CONTROL SUPERVISOR/TECHNICIAN

NOTES:

[illegible]